Government Arrears and Corporate Decisions: Lessons from a Natural Experiment*

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December 23, 2024

Abstract

We study how late payment in public procurement affects corporate decisions by leveraging a public program that unexpectedly repaid local government arrears. Our identification strategy compares firms included in the program with similar firms that were accidentally excluded. Early repayment of arrears leads to heterogeneous corporate responses. Financially constrained firms adjust their real operations, increasing investment and repaying suppliers. In contrast, financially unconstrained firms reshape their financial structure by repaying debt. Both types of firms build up cash reserves as a buffer against future cash flow uncertainty. Lastly, the accumulation of arrears deteriorates procurement relationships, which barely recover after repayment.

JEL classification: G31; G32; G38; E51
Keywords: arrears; liquidity; investment; procurement; trade credit

*We thank Rolf Campos, Olivier Dessaint, Bryan Graham, Denis Gromb, María Gutiérrez, Federico Kochen, Felipe Martínez-Rico, Fernando Navarrete, Luis Nuño, Annette Poulsen, Yaxuan Qi, Daniel Wolfenzon, participants at the HKU Summer Finance Conference, Northern Finance Association Conference, Boca-ECGI Corporate Finance and Governance Conference, Spanish Finance Forum, Cemfi MadBar Conference, INSEAD Finance Symposium, CUHK International Finance Conference, CUNEF, Spanish Economic Association Conference, and LSE for their help and comments. We acknowledge the access to the data provided by the Instituto de Crédito Oficial (ICO). All views expressed are those of the authors and should not be attributed to the ICO.

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1 Introduction

Government procurement, i.e., the purchase of goods and services on behalf of a public authority, accounts for a substantial part of the global economy. According to the World Bank, public procurement in 2020 represented between 13% and 20% of world GDP, while global expenditure on procurement was close to 9.5 trillion US dollars.[1] Government contracts provide some advantages to firms. In particular, they are especially important for many small local businesses (García-Santana and Santamaría, 2023) as they provide a more stable demand over non-public customers, especially in recession periods (Goldman, 2020). However, governments can be slow in making payments, and arrears (i.e., overdue payments not made by their scheduled due date) often accumulate. The ability to pay late can be very useful to governments; allowing them to manage their liquidity needs and having positive spillovers on their long-term financing (Benigni, 2024). However, late payment can also have negative implications for procuring firms. This issue was evident during the European sovereign debt crisis that followed the global financial crisis. The late payment of procurement is still commonplace in many developed and developing economies.

While there is extensive literature on the economics of procurement, the financial aspects of supplier–government relationships are less explored. In this paper, we contribute to filling this gap by studying how firms deal with the late payment of procurement debt. To do so, we exploit a large-scale financing plan that repaid the accumulated arrears of local governments to their suppliers. Repayment was staggered across similar firms over two different years due to an administrative oversight. This provides us with a natural experiment to explore its effects. Our results show that repayment significantly affects suppliers' corporate investment, leverage, and liquidity. Firms have heterogeneous responses according to how financially constrained they are. Financially constrained firms respond by adjusting their real operations, increasing investment, and repaying their suppliers. In contrast, financially unconstrained firms primarily respond by reshaping their financial structure, focusing on repaying financial debt. Both constrained and unconstrained firms build up their cash reserves as a buffer against future cash flow uncertainty.

[1] See https://www.worldbank.org/en/news/feature/2020/03/23.

This heterogeneous reaction of firms to early repayment of arrears allows us to infer how firms deal internally with the accumulation of arrears in the first place. While financially constrained firms seem to delay investment, deplete cash and increase borrowing from their suppliers, financially constrained firms are able to borrow from banks and accommodate the effects of late payment. Our findings also suggest that the accumulation of arrears harms procurement relationships.

The cost of delays in payment by the public sector is a concern that regulators worldwide share. For instance, the European Commission issued a late-payment directive (LPD) in 2011 to standardize payment terms, impose late payment penalties, and establish uniform regulations.[2] Similarly, in the US, states such as Illinois, New York, and Massachusetts enforce interest penalties for late payments on public projects to induce prompt repayment and to ease the financial strain that delayed payments can put on the private sector.[3] Although establishing penalties and late payment interest has incentivized on-time payment, state comptrollers still routinely report the late payment of procurement invoices. Similarly, in China, the accumulation of arrears by local governments and its impact on corporations is a significant issue and a matter of current national debate.[4]

In developed economies, public arrears are common, but default is extremely rare, and suppliers are ultimately paid. Given this, in the absence of financial frictions, firms should be able to borrow using their government arrears as collateral, implying that repayment speed would not alter corporate actions. However, when firms face financial frictions, the late payment of public procurement may force firms to change their plans. For example, firms may decide to postpone investments and avoid future procurement contracts. Given this, the extent to which government arrears are costly to firms is a relevant empirical question linked to the presence of

[2]This directive mandates that payments from government to businesses that are not completed within 30 days should allow creditors to claim interest and recovery costs. See Directive 2011/7/EU, On Combating Late Payment in Commercial Transactions, 2011 O.J. [L. 48], 2 for more details.

[3]This trend of requiring interest on unpaid bills has expanded to other states. For example, Louisiana Governor John Bel Edwards enacted Act No. 566 on May 30, 2018. This update to the Louisiana Revised Statute Section 38:2191(B), effective August 1, 2018, mandates that public entities pay interest on late payments. According to the amendment, payments are considered late, and interest begins to accrue 45 days after the public entity receives a proper request for payment. The interest rate is set at 0.5% daily and is capped at 15%.

[4]See for example this *Yicai Global article.*

financing constraints. We approach this question by analyzing firms' reactions to the accelerated repayment of arrears.

A major challenge in examining this question empirically is that the payment terms for arrears are frequently influenced by the specific circumstances of both buyer and seller, creating a standard endogeneity problem. To address this problem, an ideal approach would involve unexpectedly accelerating the repayment of government arrears for a random subset of firms. We take advantage of a natural experiment that mimics this ideal field experiment. A program in Spain in 2012 accelerated the repayment of regional government arrears. Some firms received a sizeable unexpected payment and reduced accounts receivable, while a random subset of comparable firms did not.

In 2012, the Spanish government paid overdue amounts to almost 135,000 suppliers. Following the financial crisis, regional governments had accumulated arrears owed to suppliers. The volume of arrears totaled close to €30 billion (equivalent to 3% of Spanish GDP). Prior to 2012, firms had largely not anticipated this cash injection.[5]

A key element of this repayment program is that, at its inception in 2012, the program accidentally excluded a group of firms. This omission was due to a legal oversight that failed to include those firms that had contracts with groups of municipalities, known as *mancomunidades*. The oversight was subsequently rectified, and the omitted firms were paid one year later in 2013.[6] Our research design compares the firms paid by the initial repayment program in 2012 (referred to as Phase I firms) with those that were paid one year later under the amended plan for exogenous reasons (referred to as Phase II firms). Both groups of firms are comparable in their characteristics before 2012. The unexpected nature of the program and the availability of a naturally exogenous control group make this liquidity injection an ideal setting to study the effects of repaying accumulated arrears.

Our results show that there are real effects associated with the accelerated payment of

[5]News coverage on the repayment program appeared for the first time in mid-January 2012. Legislation was passed in March, and the payments were made between May and July. See Figure IA.1 in the Online Appendix for details of the news coverage.

[6]In total, about 5,000 suppliers (with arrears amounting to around €1 billion) were paid in mid-2013 instead of mid-2012.

government arrears. The repayment program affected corporate investment, leverage, and liquidity decisions. In particular, we find that an unexpected repayment shock equivalent to more than 10% of a firm's assets led firms to increase their investments by 11%, reduce their leverage by 13%, and increase their cash reserves by 40%. These measures are statistically and economically important, representing (respectively) around 25%, 30%, and 37% of the standard deviations of firm investment, leverage, and liquidity growth. The consequences of this program are useful to understand the effects of reducing government arrears and providing liquidity to firms. The effects are also informative about the cost that government arrears entail for firms and how firms have made changes in strategies to minimize these costs, given investment opportunities and financing constraints.

Our findings shed light on the actions that firms took to address the accumulation of arrears and late payments. The results suggest that firms with unpaid customer bills will likely delay investment opportunities and borrow to continue operations. The added liquidity in these firms after the repayment is consistent with the presence of financial frictions and with a costly uncertainty about future payment delays.

In theory, in the absence of financial constraints, arrears should have no effect on economic activity. However, we expect significant effects when financing constraints are present, with a heterogeneous response across firms depending on the intensity of these constraints. In particular, firms' responses should vary across the ability of firms to borrow during the accumulation of arrears. In principle, firms with government arrears can borrow against their public invoices, using them as collateral in factoring contracts with banks. However, regulatory frictions and banks' liquidity constraints limit the ability of banks to engage in factoring contracts. Moreover, factoring activity is heterogeneous across banks. We show that, during this period, banks that are in a better financial position expand their factoring activity relative to those that are more constrained. Better banks may also be able to extend other forms of borrowing to their customers to help them accommodate the liquidity needs induced by the accumulation of public arrears.

We extend the analysis of the accelerated repayment of arrears by conditioning on the

financial constraints of firms. We proxy financial constraints using the firms' pre-determined exposure to specific banks that were more or less affected by the crisis (see Chodorow-Reich (2014), Jimenez et al. (2014) and Bentolila et al. (2018) for a similar approach). The results show that financially constrained firms increase their investment after the liquidity injection while they reduce a small fraction of their leverage. This suggests that financially constrained firms delayed investment opportunities and indicates that, in contrast with the unconstrained benchmark, large government arrears can indeed be costly to firms that face financing constraints. Conversely, financially unconstrained firms do not increase their investments after the repayment program and instead reduce a larger fraction of their leverage. This suggests that these firms were able to borrow against their collateral or future cash flows and possibly against their accounts receivable with local governments.

The reduction in leverage is also heterogeneous across financing constraints. Financially unconstrained firms reduce more leverage, and this is mostly financial debt. Conversely, we find that financially constrained firms mostly decrease their accounts payable following the cash injection. This suggests that trade credit might serve as a substitute for bank financing for more constrained firms, although it is insufficient to avoid the decrease in investment. Additionally, this finding sheds light on how the effect of government arrears may be transmitted to the supply chain through trade credit.

We observe that firms tend to increase their cash reserves, irrespective of their financing constraints. This result is consistent with the fact that firms facing an episode of delayed payments may have depleted some of their cash below their long-term optimal levels. It may also reflect that firms decide to hold onto more cash to help cover future late payments and other short-term costs.

To corroborate these results, we provide additional evidence in which we depart from our natural experiment and we focus on the the period of the build-up of arrears (2009-2011). We compare firms with procurement arrears to a matched sample of firms without. The firm policies during this period are very consistent with the results implicit in our main analysis. Given that this section uses a completely different research design, this additional analysis reinforces the

validity of the main results of the paper.

Finally, we study how the repayment of accumulated government arrears affects the relationship dynamics between firms and public procurement. Our findings indicate that if public administrations delay their payments, their customers may reduce public procurement contracting with them. This result is significant in terms of the probability and size of contracting. This suggests there is a deterioration in the relationship, which negatively affects the decision to establish new contracts between a firm and its public customers. Once late payment stops, there is no further deterioration of the commercial relationship, but the lost links due to arrears do not recover.

Our study is linked to several strands of the literature. First, we contribute to the literature on the financial aspects of procurement. Procurement is helpful in providing firms with a stable income during recessions (Goldman, 2020). Di Giovanni et al. (2022) expand on this idea to show the implications of firms using their procurement relationships as a form of collateral that can ease financing constraints. Similarly, Gabriel (2022) shows that Portuguese firms use procurement contracts as collateral to increase their amount of lending. Lee (2021) shows that particularly procurement-dependent firms grow more, which is especially true for financially constrained firms. These papers show different beneficial aspects of procurement for firms. However, Bonfim et al. (2021) show that when government spending is unexpectedly cut during a financial crisis, procurement-focused firms find it harder to borrow. In our paper, we also study the negative effects of procurement, but we focus on analyzing delayed payment.

Several other papers have analyzed different aspects of the trade credit linked to the speed of payment in procurement. Barrot and Nanda (2020) focus directly on formal trade credit terms in procurement contracts and show that shorter formal payment periods can have a positive effect on firms. In particular, they find a positive effect on employment when the US government shortened the formal trade credit length to its business contractors, but only in labor markets that are not too tight. Relatedly, Checherita-Westphal et al. (2016) show that increased delays in some European governments' payments can affect the liquidity and profits of the private sector, whereas Conti et al. (2021) show that stricter regulation to minimize

late payment reduces firms' exit rate. We study government arrears (i.e., late payment) rather than the formal trade credit terms of procurement (i.e., contractual maturity). Our natural experiment posits a large one-off reduction of arrears rather than a smaller but more persistent one, as in Barrot and Nanda (2020). We also focus on the interaction of the late payment of arrears with financing constraints.

More broadly, our paper also contributes to the literature on the different stimulus policies to channel liquidity to the corporate sector (Lelarge et al., 2010; Banerjee and Duflo, 2014; Brown and Earle, 2017). The impact of any directed policy is typically difficult to evaluate, primarily due to potential selection biases. In our natural experiment, the government effectively executes an unorthodox form of fiscal policy in that the government borrows from banks to accelerate the repayment of accumulated arrears. Although government liabilities remain unchanged, this policy has real effects, particularly for financially constrained firms.

Finally, our work contributes to several strands of the trade credit literature. We show the potential costs for suppliers when they finance a large buyer via trade credit (Murfin and Hjorge, 2015; Klapper et al., 2012). We add to the understanding of the costs of late payment and its interaction with financing constraints. While late payment has been well documented in the literature (Petersen and Rajan, 1997), the theoretical literature focuses on its role as insurance for the buyer (Cuñat, 2007; Wilner, 2001), which is unlikely to be a relevant motive when the buyer is the government. Moreover, the empirical literature on late payment is very limited so far. We also contribute to the very scarce literature on trade credit factoring by implicitly showing that firms cannot discount government arrears even when the creditworthiness of the government is good.[7]

The rest of the paper is organized as follows. In Section 2, we provide an analytical framework and background information on the institutional setting for the repayment program. Section 3 describes the data and the construction of the main variables. The empirical strategy and results are presented in Section 4. Section 5 discusses how financing frictions may affect the results. Section 6 discusses the effects of late payment by public entities on procurement contracts,

[7]See Smith and Schnucker (1994) for one of the few contributions to understanding the factoring contract.

while Section 7 concludes.

2 Analytical background and institutional setting

In this section, we describe the procurement process and the institutional setting, and we lay out the natural experiment that we use for identification purposes.

2.1 Analytical background

From the perspective of a supplier firm, government arrears can be characterized as an illiquid asset with uncertain maturity. In principle, if suppliers are paid with such illiquid assets, it could lead them to liquidity constraints, potentially affecting the firm's ability to invest or continue operations.

However, late payments in procurement contracts should not significantly impact firms' decision-making, provided that firms can use arrears as collateral. Arrears can mechanically create liquidity by offering a viable means to obtain loans. Factoring contracts are the most common way for firms to borrow using invoices as collateral. If government arrears are perceived as safe assets, firms may leverage them against future cash flows from their procurement contracts, thus mitigating the effects of delayed payments. In Spain, as in most developed countries, procurement trade credit contracts with municipal and regional authorities are implicitly guaranteed by the central government, suggesting that, barring financing constraints, procurement invoices should effectively generate sufficient collateral to offset any late payments.

The first empirical question of this paper aims to evaluate if this holds true. Specifically, we examine whether the anticipated repayment of government arrears produces tangible effects. The unconventional fiscal policy that we use as a natural experiment replaces one illiquid asset (arrears) with a liquid one (cash) in the balance sheet of supplier firms. In principle, if arrears generate their own collateral and liquidity, this fiscal policy should have no effects. However, our results suggest that this is not the case. Despite their "safe" label, arrears are an imperfect form of collateral, and factoring contracts or other types of financing are not adequately protecting

firms against illiquidity. In the next section, we provide some arguments explaining why this may be the case.

Figure 1 conceptualizes this setting. The gray arrows show the flow of funds and contracts of the different agents, while the blue and black arrows show the flows of the unconventional fiscal policy of the government. Note that from the joint perspective of the entire government (central, local, and regional), a liability with firms is replaced with a liability with banks. So, this policy does not entail any additional liabilities for the government as a whole. However, we show empirically that this policy has real effects.

Another empirical question is whether financially constrained and unconstrained firms have a different reaction to government arrears. Even if arrears are an imperfect form of collateral, they should not affect firms that are financially unconstrained in a broader sense. Specifically, firms can offset the liquidity constraints imposed by government arrears if they have access to alternative forms of collateral, sufficient cash flows, or can leverage their commercial relationship with the government. If financially unconstrained firms borrow during the accumulation of arrears to keep investment at its optimal levels, their early repayment will entail a reduction of leverage and an accumulation of liquid assets. Conversely, financially constrained firms facing government arrears would reduce investment, use all their available liquidity, and distort their decisions to reduce their needs for liquidity. The firms that had to postpone investment due to illiquidity problems should increase investment after the repayment.[8]

To answer these two empirical questions, we take advantage of an empirical setting in which several key elements converge: i) an accumulation of procurement arrears; ii) a policy that repays these arrears unexpectedly; iii) groups of comparable treatment and control firms; and iv) a classification of firms into financially constrained and unconstrained. These elements are all present in our empirical design. The next sections describe our empirical setting in more detail.

[8] A similar argument about the differential response of constrained and unconstrained firms in the face of a positive liquidity shock can be found in Banerjee and Duflo (2014)

2.2 Trends in public procurement and arrears

The Spanish economy suffered a severe credit crunch that originated from the global financial crisis that developed in 2008 (Bentolila et al. 2018; Jimenez et al. 2014). The financial crisis had a considerable impact on the private sector, leading to higher unemployment and depressed domestic demand (Campos and Reggio, 2015). The public sector was not left unscathed. Spain's public administrations, particularly at the municipal and regional level, experienced capital market funding problems, just like local banks, and they delayed payments to suppliers.[9]

Panel A of Figure 2 shows the evolution of municipal and regional trade credit and arrears. There is a clear increase in the amount of trade credit used (orange line). More importantly, there is a marked increase in late payments (blue line), that is, trade credit that goes beyond its contractual maturity. The peak of total trade credit use (not yet due and on arrears) happened in 2011, just before the government intervention of 2012.[10] At the same time, municipalities increased total expenditures, exacerbating budget deficits (see Panels B and C of Figure 2). The result was that the commercial debt in arrears accumulated by regional and local governments at the end of 2011 amounted almost to €30 billion (about 3% of GDP).

Simultaneously, the financial crisis created a contraction of the factoring market. The factoring market allows firms to borrow in anticipation of payment of invoices by selling them to banks at some discount. Banks often have the right to recourse to the seller if the invoice is not paid. The factoring contract is, therefore, a loan in which the invoices serve as a form of collateral, with the discount implicitly determining the interest. Figure 3 compares the evolution of sales (turnover index) with the evolution of factoring loans for the whole economy. While sales declined by 19% between 2007 and 2012, factoring loans as a fraction of GDP fell by 58%. During this period, GDP declined as well, while the prevalence and maturity of trade credit increased, so the fraction of invoices that were being factored shrank even further than 58%. All this evidence, together with a context in which firms had an increased demand for liquidity,

[9]Trade credit maturities were generally extended during this period, but the effect was more pronounced in the public sector. Figure IA.2 compares the evolution of average delayed payment days in the private and public sectors.

[10]To get a sense of the severity of late payment by 2011, 35% of total municipal outstanding trade credit was overdue by more than 12 months, 16% by more than 24 months, and 9% by more than 36 months.

suggests that the sizable reduction in factoring was largely driven by supply factors. Some of the reasons that may have induced factoring to shrink are regulatory. Despite the explicit guarantees of the central government, the European banking regulations did not consider factoring regional government invoices as a safe form of lending. Municipal and local government arrears require more regulatory capital than other forms of loans. Also, banks were not able to re-discount the arrears at the European Central Bank during this period. Facing limited lending capacity, banks shifted their focus to alternative forms of lending, such as sovereign lending (Acharya et al., 2018; Ongena et al., 2019).

2.3 An unconventional fiscal stimulus

The Spanish central government approved the *Plan de Pago a Proveedores* or *Supplier Payment Program* (SPP) to alleviate these liquidity problems of suppliers to regional and local governments. The program established a new state-owned vehicle, the FFPS (Fund for Financing Payments to Suppliers), in March 2012. The FFPS made payments directly to the suppliers of regional and local governments that held arrears dated before 2012, converting their commercial debt into financial debt held by the FFPS. The FFPS was announced in mid-January 2012, and the repayment occurred between May and July 2012. At that time, the FFPS via the Instituto de Crédito Oficial (ICO) injected €27.3 billion into the program. Regional and local governments paid the Spanish Treasury's funding cost plus a maximum margin of 145 basis points, representing favorable conditions compared to those offered in the capital markets. Their funding was guaranteed by their respective shares in the pool of state tax receipts. Panel C of Figure 2 shows how the financial situation of municipalities deteriorated from 2008 to 2011 but improved after the central government intervention.

To finance the program, the FFPS gathered funds from a syndicated loan worth €30 billion, granted by a pool containing most of the Spanish banks. The state guarantee made the loan attractive for participating banks. The liabilities of the FFPS became part of the central government debt.

This was an unconventional form of fiscal policy. As Figure 1 shows, all the agents involved

substituted an asset for an asset or a liability for a liability. The FFPS did not mean additional liabilities were incurred by local governments. Rather, the central government borrowed directly from banks what was needed to pay local government debts. Local governments were thus released from their debts with suppliers while acquiring debt with the central government. Firms substituted one asset (invoices) for another asset (cash), and the plan provided firms with a way to overcome their inability to borrow via factoring. While the implicit guarantee of the central government may not have been enough to allow firms to factor their arrears, the explicit borrowing of the central government provided them with liquidity.

2.4 The natural experiment

To estimate the causal effect of the accelerated repayment of government arrears, we take advantage of an administrative mistake that left some firms out of the initial phase of the plan.

Spanish municipalities were able to channel some or all of their purchases through *mancomunidades*. These are legal pools of several municipalities engaged in procurement that seek to achieve some economies of scale and improve their bargaining power. Although from an economic standpoint, municipalities and *mancomunidades* are very similar, they have different legal statuses. The first phase of legislation accidentally did not specify that debts with *mancomunidades* were included in the program, so their debts were not paid in 2012. In February 2013, another law was passed, resulting in a new round of the FFPS that paid the arrears to the suppliers of *mancomunidades* (as previously noted, we label these suppliers as Phase II).

The important fact for our analysis is that the reason why some firms were only paid in Phase II was due to an error in the plan's original legislation (i.e., it did not include *mancomunidades*) that was unrelated to the characteristics of the suppliers. Firms in Phase I and firms in Phase II have similar exposure to the public sector and public arrears; they are also very similar in characteristics. This is the basis of our identification strategy. We use the FFPS as a random shock that affected treated firms in 2012 (Phase I firms), but that did not affect control firms,

i.e., a quasi-randomly selected group of firms with similar characteristics (Phase II firms).[11]

3 Data

In this section, we describe the data used in this study. First, we elaborate on the data collection process and data sources and then provide summary statistics.

3.1 Data collection

The main data for our analysis are provided by the ICO. They include anonymous firm information from different phases of the FFPS. The data set includes information on each unpaid bill between a firm and each regional and local government, including amounts and payment dates. The data are matched by the ICO to exhaustive firm-level financial data from the Iberian Balance Sheet Analysis System (SABI).[12] For Phase I, the firms in the sample (i.e., those that can be matched to SABI) account for 48.2% of all suppliers (64,879 of 134,568) and almost 70% of the funds injected (€19 billion of €27.3 billion). For Phase II, the ICO data set includes about 5,000 suppliers; we match 1,848 firms, of which 1,201 are firms that also had earlier received funds in Phase I, and 647 are firms that received funds only in Phase II. Once we restrict ourselves to firms with non-missing information for all the relevant variables, our final sample has 47,735 firms for Phase I and 526 firms for Phase II.

For the section on public procurement contracts, we use a different database in which ICO's data are also matched to those of Opentender. This database includes public procurement information on contractors, public customer identifiers, and contract descriptions, including prices and amounts in more than 30 countries.

[11] Figure IA.3 provides an example of water treatment procurement in the region of Andalucia. Some municipalities contract directly for water treatment, while others do so via *mancomunidades*. There are no major selection margins between the two groups. More importantly, the firms that supply *mancomunidades* and municipalities are very similar; indeed, often, firms supply both municipalities and *mancomunidades*. In our main analysis, we use firms that participate only in Phase I as the treatment group (e.g., Firm A in the figure) and firms that participate only in Phase II as the control group (e.g., Firm B in the figure). Note that we drop any firms that appeared in both Phase I and Phase II (e.g., Firm C in Figure IA.3).

[12] SABI data are provided by INFORMA D&B in collaboration with Bureau Van Dijk, which obtains financial information from the Spanish business register. SABI covers the vast majority of companies that are incorporated in Spain but does not cover some very small companies or self-employed individuals.

We obtain accounting information on municipalities and regions from the Spanish Finance Ministry database. Data on the business turnover index and factoring (unpaid bills of exchange) come from the Spanish Statistical Office. Finally, we measure the media coverage of Phase I and Phase II using Factiva, which aims to cover the universe of news in Spain.[13]

3.2 Summary statistics

Table 1 presents summary statistics for firms in Phase I (column 1) and Phase II (column 2) in 2011, just before the announcement of the SPP. We aggregate all the unpaid invoices with all local and regional governments to calculate the total amount of arrears that each firm has.

We also have information on amounts seized by the central government.[14] For each firm, we measure the repayment shock as the total amount of arrears minus the total amount seized by the government. This results in the effective amount of euros transferred from ICO to the firm. The average repayment shock for firms in Phase I is €142,360, compared to €102,105 for firms in Phase II.

Firms in Phase I had average total assets of over €5 million and average total liabilities of over €3 million. Firms in Phase II had average total assets of more than €6.7 million and average total liabilities of over €4.5 million. As for cash, firms in Phase I and Phase II had about €280,000 and €270,000, respectively.[15]

On average, we do not observe any significant differences in the averages of variables across firms in Phase I and firms in Phase II. This suggests that the two groups of firms are comparable. Nevertheless, in Table IA.2, we match firms in Phase II to firms in Phase I using an entropy balancing matching technique (Hainmueller, 2012) on the first moment of the repayment shock and total assets. After matching, we can see that the differences between firm characteristics become even smaller, and there are still no significant differences between the two groups. We use this same matching criterion in parts of the analysis.

[13] Factiva, provided by Dow Jones, gives access to more than 6 million articles every year in more than 200 Spanish national, regional, and local newspapers and magazines.

[14] Seized amounts represent debts that firms had with the central government. These seized amounts were deducted from the total amount of arrears paid to the firm.

[15] In Table IA.1, we show aggregate descriptive statistics for the entire sample period.

4 Accelerated repayments and corporate decisions

We are interested in analyzing the effect of late payment of procurement contracts. In particular, we aim to understand whether corporate investments, leverage decisions, and cash holdings are affected by an accelerated repayment of arrears.

4.1 Empirical strategy

To assess the causal impact of an accelerated repayment of government arrears, we require a treatment group that experiences an unexpected repayment of these arrears and a control group that, despite having similar characteristics and a similar amount of unpaid arrears, does not get repaid at the same time. We mirror the ideal randomized experiment by taking advantage of the random distribution of the repayment plan's implementation, as described above. The legislative oversight in 2012 effectively created two groups of municipalities that paid at different times to a similar group of firms.

Our underlying assumption is that the only difference between firms in Phase I and Phase II is that the former received repayment in mid-2012, while the latter received it a year later, in August 2013. We test empirically the validity of this assumption. Moreover, we also use entropy matching and synthetic control techniques to further improve the balance of both groups of firms.

We use the following specification:

$$y_{jt} = \gamma Treated_j + \beta(Treated_j \times Year_{2012}) + \Lambda + \varepsilon_{jt} \tag{1}$$

where y_{jt} represents corporate decisions such as investment, leverage growth, and liquidity growth for firm j in year t. These variables are defined as the first difference of the logarithm of fixed assets, total liabilities, and cash, respectively, allowing for the interpretation of the coefficients in terms of net investment, changes in total liabilities, and changes in cash. $Treated_j$ is a dummy variable indicating firms in Phase I (value one) or Phase II (value zero). $Year_{2012}$ is a dummy variable that takes a value of one for 2012 and a value of zero for 2009-2011. We

include a vector of fixed effects (Λ) that interacts dummies for *year*, *sector*, and *region*.

The coefficient of interest, β, measures the impact of the accelerated repayment of arrears on corporate decisions for the treated firms (Phase I) relative to the control group of firms (Phase II). In particular, we compare the corporate decisions of firms in Phase I and Phase II in the period before (2009–2011) with the year of the repayment shock (2012). If there is an effect of late payment on corporate decisions, we should observe a differential effect of the repayment shock for the $Treated \times Year_{2012}$ coefficient.[16]

Next, we exploit the heterogeneity in the treatment. We sort the firms in Phase I into four different groups according to the amount of repayment over total assets that they receive: below 1%, between 1% and 5%, between 5% and 10%, and above 10%. We predict the strongest response from the firms that experience the largest repayment shock. We also expect that firms that have less accumulated public arrears will have less of a reaction.

We use entropy balancing to match each of the four groups of treated firms in Phase I with all the control group firms in Phase II, assigning positive weights to Phase II firms to exactly match the average of total assets and repayment shock of Phase I firms. This matching approach allows for a direct comparison of firms that receive a repayment shock in Phase I and firms of a similar size that experience a similar repayment shock a year later in Phase II. As in the previous specification, all the results include *year*, *industry*, and *region* fixed effects, with standard errors clustered at the firm level.

4.2 Results: Investment, leverage, and liquidity decisions

We first analyze the impact of the central government's repayment of arrears on various corporate decisions (investment, leverage growth, and liquidity growth). We exploit the plan's random repayment schedule using the structure outlined in Equation 1.

Table 2 reports the main effects of the repayment shock on investment, leverage growth, and liquidity growth. Columns 1, 3, and 5 include year, industry, and region fixed effects to control for time-specific shocks and unobserved time-invariant heterogeneity across different industries

[16]The estimated magnitude should be considered a lower bound if some firms in Phase II anticipated repayment in 2013 and thus were preemptively able to shape their corporate decisions in 2012.

and regions. In columns 2, 4, and 6, we include a triple interaction of year, industry, and region fixed effects to control for time-varying sector-regional heterogeneity. We cluster standard errors at the firm level to account for potential within-firm correlation or heteroscedasticity.[17]

We observe significantly higher levels of investment and increases in cash holdings for the treated firms in the year of the repayment shock. On average, treated firms increase investment by about 5% and increase cash holdings by about 13% compared to the control group. We do not observe significant differences in leverage growth in 2012.

Table 1 shows that treatment and control groups are closely comparable. Yet, to further reduce any potential differences between both groups before 2012, we implement an entropy-balancing matching approach. This method reweighs the two groups according to the size of the repayment shock and total assets in 2011. Table IA.3 shows that the results remain similar after applying entropy matching, corroborating the findings in Table 1 that both groups are closely comparable and that investment and liquidity growth increase after the repayment shock.

In Table 3, we decompose the period before the shock into different years. The *treated* coefficient measures the differences between treatment and control firms in 2011, which is the omitted interaction and the year that we use as the baseline. The interaction of *treated* with the 2012 dummy measures the same effect as in Table 2, although it is now measured only with respect to the baseline year of 2011. The results are quantitatively similar across both tables.

The coefficients of the interactions between *treated* and the 2010 and 2009 dummies as well as the coefficient on *treated* can be seen as a test of the parallel trends assumption. We show that firms in Phase I and Phase II exhibit a similar pattern in terms of investment, leverage, and liquidity growth for the period 2009–2011.[18]

4.3 Treatment intensity

These tests aggregate all firms with arrears and provide an "overall effect" of repayment. This approach, though, gives equal weight to firms that receive minor repayments and those that

[17] In this Section, we drop firms in Phase I with arrears under 0.17% of their assets (bottom quartile) to assure that the treated group has an economically meaningful level of arrears.

[18] We report matched results in Table IA.4. Results are qualitatively similar. Again, we do not observe significant differences between firms in Phase I and firms in Phase II before 2012.

receive larger ones. The vast diversity in the size of the repayment shock across firms might contribute to the mildly significant outcomes, as the level of arrears varies significantly from company to company. Thus, we expect that, for firms with smaller arrears, the timing of repayment in 2012 or 2013 should not significantly affect their corporate decisions.

To account for the heterogeneity in the size of the repayment shock, we group firms according to the amount of arrears repaid. We sort the firms in Phase I into four different groups according to the amount of cash over the total assets they receive: below 1%, between 1% and 5%, between 5% and 10%, and above 10%. We expect stronger results for firms in the top quantile. The lower quantile also serves as a placebo test to confirm that the different reactions from firms in Phase I and Phase II are indeed due to the accelerated repayment.

First, we assess firms' responses in terms of investment decisions. The results are presented in Panel A of Table 4. Each column shows the level of investment of firms in Phase I, stratified by the level of arrears, versus a matched sample of firms in Phase II. The results show that treated firms increase investment relative to non-treated firms. The effect is monotonically increasing with the level of the repayment shock in 2012. These results are consistent with the hypothesis that firms exposed to late payment might have forgone investment opportunities and reacted by increasing investments upon receiving the repayment shock. These results imply a certain degree of financing constraints affecting the firms in the sample, and are inconsistent with the view that government arrears can always be used as a reliable source of collateral. We find a clear, monotonic relation between the size of the repayment shock and the firm investment response. Firms experiencing the most substantial repayment shocks (those above 10% of their total assets) show a significant 11.4% increase in investments relative to their Phase II counterparts. Table IA.1 indicates this increase in investment is economically important, as it represents about 25% ($0.114/0.47 = 0.25$) of the standard deviation of the investment growth of the firms in our sample.

Next, we study the impact of a repayment shock on corporate leverage decisions. Panel B of Table 4 shows that firms significantly reduce leverage upon receiving a repayment shock that amounts to above 10% of their total assets. Treated firms reduce their leverage growth by

about 13% compared to firms in Phase II. In economic terms, this reduction represents about 30% (0.13/0.44 = 0.30) of the standard deviation of changes in leverage during our sample period. These results suggest that when firms receive an unexpected injection of liquidity, they use these funds to pay off their outstanding liabilities, which would not only reduce their debt burden but also improve their financial health. The repayment is especially pronounced for firms that have substantial arrears, as they receive a greater positive repayment shock, enabling them to reduce their leverage.

Lastly, we study the impact on cash accumulation and present the results in Panel C of Table 4. We find a positive, monotonic relation between the size of the liquidity injection and the increase in cash holdings after repayment. Firms experiencing the most substantial repayment shocks (again, those above 10% of their total assets) keep about 40% more cash than Phase II firms. This increase is economically meaningful. Given the distribution of changes in repayment by firms in our sample, the increase in cash represents about 37% (0.40/1.08 = 0.37) of the standard deviation. As expected, the cash accumulation is particularly evident in firms receiving a greater repayment shock, as they consequently have more funds to retain.

This result implies that firms use the repayment shock not just for investment and to reduce leverage but also for cash accumulation. This increase in cash holdings is consistent with firms keeping some precautionary savings, either as a buffer that protects them against financial distress or to gain more flexibility in their future operational and strategic decisions.

Overall, this set of results shows that the intensity of the positive repayment shock affects the firm response, which is monotonically increasing in the level of the shock across all three specifications. In all specifications, we are matching each group of treated firms (Phase I) to a comparable group of non-treated firms (Phase II). In the next set of specifications, we propose alternative specifications to explore this heterogeneous response.

4.4 Alternative specifications

We introduce two further specifications. A specification with firm fixed effects where we control for the potential impact of the firm's unobserved heterogeneity and a synthetic difference-in-

differences specification that is robust to some violations of the parallel trends assumption.

In Table 5, we estimate a specification similar to that in Equation 1, but we add firm fixed effects. We include *year* × *industry* × *region* and *firm* fixed effects, and our variable of interest is the interaction term *Treated* × *Year 2012*. This enhances the robustness and precision of the regression estimates by controlling for unobserved, time-invariant heterogeneity among firms and mitigates potential omitted variable bias.

Panel A of Table 5 details the effect on firm investment decisions. The results in Panel A of Table 4 are confirmed. In particular, as the extent of the repayment shock increases (from below 1% to above 10% of total assets), we observe a monotonic increase in the effect on investment. The impact is most significant for firms that receive a repayment shock greater than 10% of their total assets, increasing investment by approximately 8% on average. The t-statistic of 2.68 indicates that this result is statistically significant at the 1% level.

Panel B evaluates the effect of repayment shocks on leverage decisions. Here, we see that only firms receiving a large repayment shock (greater than 10% of their total assets) show a significant reduction of 15% on average in their leverage. This effect is highly statistically significant, with a t-statistic of -4.13, indicating that the effect is robust at the 1% level. These results are in line with the findings in Panel B of Table 4.

Panel C investigates the relation between the amount of the repayment shock and liquidity decisions. Here, we see a significant effect for firms receiving repayment shocks amounting to more than 5% of their total assets. Again, the effect is strongest for firms with a repayment shock above 10% of their assets. In economic terms, these firms increase their cash holdings by more than 42%. The results are in line with those described in Panel C of Table 4.

Taken together, these results provide strong evidence that greater repayment shocks lead to more significant changes in corporate decisions. All the point estimates are monotonically linked to the size of the shock, and the effects are statistically significant for the most affected group of firms. Firms experiencing the most substantial shocks are more likely to increase investments, reduce their leverage, and retain larger cash holdings.

To add robustness to the main results, we also develop a synthetic differences-in-differences

(SDiD) approach following the estimator for causal effects with panel data described in Arkhangelsky et al. (2021). The SDiD approach constructs a synthetic control group that best mimics the treatment group's trend in the pre-treatment period. Each treatment firm is replicated by re-weighting a sparse combination of units from the control group. For the re-weighting, more importance is given to those observations closer in time to the treatment point. This approach can be particularly advantageous when the treatment effect is heterogeneous or when the assumption of parallel trends may not be strictly held. This procedure is often applied when there is a limited number of treated or control units, which is the case for the firms in Phase II.

Thus, in this part of the analysis, we designate the firms in Phase II as the treatment group, and the control group is the firms in Phase I. The weights are chosen to optimally match the pre-adoption outcomes of the firms in Phase II and capture any possible trends. The difference between the observed outcomes post-adoption and the predicted outcomes is the estimated treatment effects using the method in Abadie (2021). The results, as shown in Table IA.5, are similar to those in Table 5.

By confirming that the results hold under the SDiD approach, we show that our results are not driven by any particular specification of the control group or any potential violation of the parallel trends assumption. In essence, this conservative approach provides an additional robustness test of the treatment effect, and it helps underscore the robustness of our main findings: An accelerated repayment of accumulated public arrears has significant implications for firm investment, leverage, and liquidity decisions.

5 The role of financing frictions

The results shown so far suggest that firms with unpaid customer bills will likely delay investment opportunities and borrow to continue operations. The added liquidity in these firms after repayment is consistent with the presence of financial frictions and with costly uncertainty about future payment delays. Thus, in this section, we discuss the role of financing frictions

in the context of government arrears and extend the empirical analysis by conditioning on the financial constraints of firms to shed light on the heterogeneous responses caused by the accelerated repayment of arrears.

5.1 Measuring financing constraints

In a frictionless financial market, firms should be able to borrow using their government arrears as collateral. If this were the case, we should not observe an increase in investment for financially constrained firms after the government cash injection. As Figure 3 shows, factoring became less of an option during this period due to the severe credit crunch affecting the Spanish economy. In 2007, the annual factoring volume was above 30% of the Spanish GDP, but after the financial crisis burst, it dropped steadily to almost a third of its previous volume. Such a decline was much more severe than the reduction in economic activity, which can be seen in the Spanish business turnover index.

We analyze whether the effect of the repayment shock on several corporate outcomes depends on how financially constrained firms are. As a measure of financing constraints, we use the firms' banking relations. We classify firms into "top banks" if they worked with at least one top bank in 2009.[19] We define top banks as those with a core equity tier 1 (CET1) capital ratio above 7.4% of risk-weighted assets, which was the average CET1 capital ratio for the overall Spanish banking sector in the adverse scenario of the stress tests run by the European Banking Authority (EBA) in 2011.[20]

Bank stress test results are an indicator of a bank's vulnerability and its capacity to lend. Bank–firm relations are known to be quite stable (Petersen and Rajan, 1994; Santos and Winton, 2008; Darmouni, 2020). Bentolila et al. (2018) and Jimenez et al. (2014) also show that the financial crisis had a heterogeneous impact on Spanish banks, which affected firms through bank–firm linkages. Relatedly, and more closely linked to our paper, factoring transactions shrank sharply during this period (as shown in Figure 2), and they did so differently across

[19] If the company does not report bank relations in 2009, we use the last available reported relationship before 2009. If the company does not report any bank information before 2010, we use 2010 information.

[20] See the following website for the 2011 EBA stress tests results for Spanish banks: https://www.bde.es/wbe/en/noticias-eventos/otros-temas-interes/pruebas-resistencia-sector-bancario-europeo/

banks. Figure IA.4 shows the average amount of factoring of Spanish SPP arrears by top banks vs. non-top banks. One can see that top banks were able to provide more factoring than non-top banks, particularly after the onset of the financial crisis in 2008.

We use the specification in Equation 1 and split firms into "top banks" or "excluding top banks," depending on whether, in 2009, they worked with at least one top bank.[21] We also split firms according to the size of the repayment received. We look particularly at firms that received a repayment shock below 1% of their total assets and firms that received a repayment shock above 10% of their total assets. Firms in the lower repayment group act as an additional control group for our analyses. Firms in the higher repayment group received a greater shock and are the most "treated" firms. Thus, consistent with our results in Section 4.3, they are expected to react more to the shock. The information on these two groups allows us to extract conclusions on whether the reaction of firms to late payment depends on the extent of the accumulated arrears.

5.2 Bank heterogeneity

Panel A of Table 6 shows that only firms that were not linked to top banks and had accumulated substantial arrears increase their investment significantly after the 2012 repayment. This suggests that firms operating with top banks are not financially constrained and do not curtail investment despite their accumulation of arrears. In particular, firms that did not operate with a top bank and receive a large repayment shock increase investment by 9%.

In Panel B of Table 6, one can see that firms with at least a top bank significantly reduce liabilities once they receive the repayment shock in 2012. This shows that firms working with top banks that receive a large repayment shock repay liabilities to reduce their leverage growth by 18.4%. Firms with no relationship with top banks devote less to reducing leverage (13% reduction). This is an important result, as it highlights that firms that were less financially constrained were able to borrow more and invest more (as shown in Panel A) during the accumulation of arrears. Once the arrears are paid, less constrained firms devote a larger share

[21] In Table IA.6, we show that Phase I and Phase II firms are very similar in 2011, regardless of whether they work with top banks or not.

of their liquidity injection to reducing leverage. This is consistent with having accumulated more liabilities and with having already invested in their most profitable investment opportunities. Still, firms with no relationship with top banks significantly reduce leverage, so in the next section, we decompose leverage and show that these firms managed to borrow from suppliers, not from banks.

Panel C of Table 6 shows that both groups of firms significantly retain cash after receiving the repayment. Firms with top banks increase cash holdings growth by 53%, and firms without top banks increase cash holdings growth by 40%.[22] This accumulation of cash may be a buffer for future investments or some other form of precautionary saving.[23] Relatedly, our results in Panel A of Table 6 may be interpreted as a lower bound of the effect that a similar program could have in the context of expanded investment opportunities or in a context in which firms are less prone to retain cash. Firms without top banks might be willing to retain cash even if they simultaneously increase investment because greater cash balances make them safer. Harford et al. (2014) show that firms mitigate refinancing risk by increasing cash holdings and conserving cash. Our results are in line with Cunha and Pollet (2020), which show that unconstrained firms can rely more on external financing when investment opportunities arise, while financially constrained firms prefer to keep high cash levels.

5.3 Financial debt and trade credit

Next, we analyze the impact of late payments on firms' leverage. In particular, Panel A of Table 7 shows that firms with top banks that had larger arrears significantly reduce financial debt. This confirms the interpretation of Panel B of Table 6 and suggests that less financially constrained firms were able to increase debt levels temporarily to offset the financing needs that originated from the accumulation of arrears. In column 4 of Panel A, however, we show that firms that did not use top banks do not significantly reduce financial debt after repayment, which suggests

[22]Note that in 2011 firms with top banks held 4.8% of their assets in cash, while firms without top banks held 6.4%. See Table IA.6. Therefore, as the relative increase in cash is very similar across both groups, the accumulation of cash relative to assets is more intense for constrained firms.

[23]See for example Bates et al. (2009) for evidence on precautionary motives driving firms to increase their cash ratios in riskier times.

they could not increase debt levels when arrears accumulated before 2012. Instead, column 4 of Panel B shows that financially constrained firms significantly decreased their accounts payable after repayment in 2012. These results suggest that financially constrained firms had to recourse to delayed payments to suppliers before 2012 because financial debt was unavailable to them.[24] Thus, these results provide evidence that late payments by local governments may spread through the supply chain, particularly for financially constrained firms.[25] Moreover, these findings speak to the importance of the government policy that we are analyzing, as the repayment program may impact not only firms with arrears but also connected firms.

Overall, our findings in this section suggest that firms not borrowing from top banks (e.g., firms that are arguably more financially constrained) significantly increase investment and reduce their accounts payable upon repayment, implying the easing of their financial constraints. Conversely, companies that had the possibility to borrow from top banks, which are less financially constrained, do not increase investment significantly in the period after the repayment. Rather, these less financially constrained firms allocate a greater portion of the repayment to reduce their outstanding leverage and, in particular, financial debt. These results suggest that firms were able to obtain financial debt by borrowing against their accounts receivable with the local governments. Both groups of companies significantly increase their cash holdings, suggesting that, after facing an episode of delayed payments, firms decide to hold more cash to help cover future late payments and other short-term costs, even when they had the capacity to borrow against these unpaid bills.

5.4 Firm responses to late payment

In the previous section we analyze the firm actions in response to the accelerated repayment of arrears as an indirect way to infer their policies during the build up of public arrears. In this section we explore some direct descriptive evidence of these same effects.

[24] See Garcia-Appendini and Montoriol-Garriga (2013) for a depiction of how financially constrained firms are supported by less constrained suppliers during the financial crisis.

[25] Alfaro et al. (2021) show that bank credit shocks can propagate downstream in the supply chain and affect suppliers in a sample of Spanish firms in a similar time period. See also Boissay and Gropp (2013) for a study of French firms that demonstrates how trade credit default shocks can propagate downstream.

More specifically, we measure the effects on investment and financing decisions during the build up of public arrears in the 2009-2011 period. To do so, we depart from our main identification strategy. Our treatment group includes firms with public arrears exceeding 1% of their assets in 2011. The control group is a re-weighted sample of almost 90,000 Spanish firms with no arrears or arrears below 1%. We use the weights to match the first and second moments of the firm characteristics and relevant outcomes in 2008 for the treatment and control group. Panel A of Table IA.7 presents summary statistics of the matched sample in 2008, showing no significant differences between the two groups.

In Panel B of Table IA.7 we show the baseline results. Each coefficient can be interpreted as the average deviation of the dependent variable between treated and control firms during the 2009-2011 period. All regressions include year x region x industry fixed effects. During this period, firms exposed to arrears hoard more liquidity and borrow more, both from banks and from their suppliers. In Panel C, we separate the results across firms that work with or without top banks. The results show that the reduction in investment is mainly driven by financially constrained firms who borrow mostly from their suppliers. On the other hand, firms with better access to finance do not reduce their investment. Instead, they borrow more from banks. Both groups of firms hoard additional liquidity. These results are consistent with those in sections 5.2 and 5.3 and show that the response of firms to late payment depends crucially on their levels of financing constraints. While firms with top banks managed to absorb the late payment shock by securing additional bank loans, financially constrained firms were unable to do so, forcing them to cut investment and extend payables to suppliers. From a policy perspective, the results highlight the significant impact of late public procurement payments, emphasizing the need to consider firms' financing constraints.

Note that the research design underlying our main results differs significantly from the design used in this section. The time periods, control groups, and the assumptions required for causal interpretation vary between the two specifications. However, the consistency of the results across both sections serves to cross-validate our findings.

6 Arrears and public procurement contracting

In this section, we study how delayed payments from public administrations influence procurement contracting within a firm-customer relationship. In principle, several effects could be at play. Firms with existing arrears may want to contract with the same public administrations more often as a way to enforce the repayment of arrears by keeping the commercial relationship open. Conversely, firms may want to cut their commercial relationship with the public administrations if the existing arrears signal further late repayments that they cannot face.[26]

In this section, we focus on firms that have contracts with local administrations (municipalities or municipal councils) and study whether there is a distinct behavior in public contracting between firms with unpaid public arrears and firms that are paid in a timely manner.

To examine the effects of delayed payments on public procurement contracting, we employ a new specification in which each observation measures new procurement contracts at the firm-customer-year level. The research design consists of examining the procurement contracting of a firm with a municipality with whom it holds arrears and the contracting of the same firm with another municipality with whom it does not hold arrears while controlling for demand effects at the local level and supply shocks at the firm level.

To do so, the ICO database is merged with the Opentender database. Opentender is a comprehensive European-level public online database that compiles extensive information on government procurement activities.[27] We aggregate the contract-level data in Opentender to a firm-customer-year level, where "customer" refers to a local government of a municipality and "firm" to a supplier listed in Opentender. We aim to analyze the decision-making process behind potential contracts between firms and municipalities. To do this, we construct a panel dataset using the following method: For each municipality-firm pair, if there is any new contract in the Opentender database during our sample period (2009–2012), we record that contract in the

[26]Relatedly, Breza and Liberman (2017) show that imposing legal limits on the maturity of trade credit contracts affects customer–supplier relationships.

[27]For procurement contracts to appear in Opentender, there is a threshold on size that is sector-specific and depends on the type of government and type of contract. The median contract size in Opentender is €350,000, which implies that contracts are much larger than those in ICO.

data. Then, we fill with zeros all the other years for that firm-municipality pair for which there is no contracting. Thus, in our dataset, we are assuming that each firm-municipality pair listed in Opentender holds the potential to engage in procurement contracting in any of the years in our sample. Additionally, drawing on the data from the ICO database, we augment this dataset with information on public arrears for each municipality-firm pair already in our dataset.[28] In the merged dataset, each observation provides information on the size of the contract, along with the accumulated arrears for every municipality–firm-year combination. This dataset allows us to study the decisions of firms to engage in new business relationships with public entities, particularly in the context of payment delays.

We hypothesize that a firm's level of unpaid bills, or "arrears", with a specific customer may affect its decisions regarding procurement contracting with that same customer. Specifically, we aim to study whether contracting with public governments changes if firms have arrears. To test this, we compare firm–customer pairs with different levels of arrears while controlling for aggregate demand changes at the local level and aggregate supply shocks at the firm level. Thus, we include firm $\times$ year fixed effects to isolate firm-specific shocks and implicitly compare the contracting of a firm with a municipality that is not paying on time with the contracting of that same firm with a different municipality that is paying on time. In addition, we also include municipality $\times$ year fixed effects to identify firms with similar exposures to economic conditions and local demand at the municipality level.[29]

We estimate the following specification:

$$Contract_{jit} = \beta_t(Arrears_{ji} \times Year_t) + \lambda_{jt} + \delta_{it} + \varepsilon_{jit} \tag{2}$$

where $Contract_{jit}$ is either an indicator variable to denote whether firm j enters a new public procurement contract with municipality i in year t, or the actual size of those contracts.

[28] Since we study how the 2012 repayment of accumulated arrears affects firms' public procurement decisions, we focus on Phase I firms only.

[29] Accounting for aggregate demand in procurement is important. For example, Garcıa-Santana and Santamarıa (2023) show a significant level of home bias and local concentration in procurement. In addition, several factors can affect the likelihood of a procurement contract and the existence of arrears; for example, Ricca et al. (2020) show that the speed of payment in procurement contracts is affected by a firm's political connections. Ferraz et al. (2015) shows that firms awarded procurement contracts have a higher likelihood of winning more public auctions in the future. This shows that trade relations have a bilateral component.

$Arrears_{j,i}$ is a dummy variable taking a value of one if firm j has accumulated arrears with municipality i at the end of 2011, and taking a value of zero otherwise.[30] $Year_t$ are dummy variables for years 2009, 2010, 2011, and 2012, respectively. Firm-time (λ_{jt}) and buyer municipality-time (δ_{it}) fixed effects absorb any firm- and municipality-specific time-varying shocks, respectively. The coefficients of interest are β_{2011} and β_{2012}, which reflect the effect on procurement contracting of having public contracts that are paid late relative to having public contracts that are paid on time for the year in which arrears accumulated the most (2011) and the year when they were eventually repaid (2012). The coefficients β_{2009} and β_{2010} are expected to exhibit a lower effect than the coefficient β_{2011}, since most of the accumulated arrears at the end of 2011 are from 2011. Standard errors are clustered at the firm and municipality level.

The results are shown in Table 8. In Column 1, the dependent variable is one if there is a new contract between a firm and a local government and zero otherwise. Column 2 adopts a more continuous specification where the dependent variable takes the value zero if there is no contract and equals the natural logarithm of one plus the value of all awarded contracts between the firm and local government in a given year. We find that firms with accumulated arrears with a certain client are less likely to contract with that client in the year before the repayment shock (2011). In particular, we find that firms with unpaid bills are about 22% less likely to start a new contract. When zooming into the actual amount of procurement contracts, we find that having accumulated arrears leads to a decrease of about 3% of the size of contracts.

While we show that arrears negatively affected procurement contracting in 2011, we also find that the effect is not significant after the repayment shock in 2012. Given the long-term nature of some of these contracts, this suggests that the accelerated repayment of arrears did not induce the recovery of commercial relations since we do not see a positive coefficient in 2012 that offsets the negative effect in 2011. This implies that relationships that break in 2011 do not recover, suggesting a certain degree of hysteresis in procurement contracts, nor do new relationships appear in 2012 to compensate for them. This has important policy implications, as it shows that while unconventional fiscal policies that accelerate the repayment of arrears

[30] In this Section, we drop firms with arrears under 0.006% of their assets (bottom 5%) to assure that the treated group has an economically meaningful level of arrears.

can quickly stop the deterioration of contracting between firms and their public customers, the commercial relationships broken due to late payments are never restored.

These findings shed light on the relationship dynamics between firms and public procurement, particularly regarding the impact of late payments on business ties between customers and suppliers. Our results indicate that if public administrations delay their payments, relations deteriorate, and customers might hesitate to pursue further public procurement contracts with them. Once the creditworthiness of customers is restored, the deterioration of the commercial relationships stops; however the firm–municipality links previously lost due to late payments are never recovered.

7 Conclusion

We study the effect of government arrears on firms' policies. We exploit, as a natural experiment, a large accelerated repayment by the government in Spain in 2012. Using a unique data set and a clean causal identification strategy, we find that firms' corporate decisions are significantly affected by the unexpected government repayment program.

We show that the impact of this policy is different across firms with different financing constraints. Financially unconstrained firms do not increase investment but, instead, use the liquidity received to repay financial debt and accumulate cash. More financially constrained firms significantly increase investment and repay suppliers after the repayment program, evidencing how this policy had spillover effects in the supply chain through trade credit.

From a policy perspective, our results provide important insight into the effectiveness of an unorthodox fiscal policy that does not change overall public liabilities but has important real effects. Early repayment of arrears affects corporate investment and economic growth and has heterogeneous effects across firms.

Further, our paper sheds light on firms' strategies to counter late payments. While less financially constrained firms can borrow to mitigate the effects of government arrears, financially constrained firms might have to forgo investment opportunities and delay payments to suppliers.

Implicitly, our research also sheds light on firms' inability to collateralize public arrears, thereby contributing to the sparse literature on financial factoring.

Our findings also underscore the impact of the late payment of accumulated arrears by public administrations on procurement contracting. We see that firms burdened with substantial arrears tend to shrink from contracting with the public sector. The repayment of the arrears stops the deterioration of the contracting between firms and public administrations but does not restore the lost links. These relationships and their impact on public procurement contracts deserve further attention, given their significant implications for both firms and public entities.

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Table 1: Summary Statistics

This table reports average firm characteristics for firms in Phase I and Phase II, the differences between the two groups of firms, and the p-values associated with those differences. Phase I includes the sample of firms that worked for local government entities that received the liquidity shock in year 2012, while Phase II includes firms that received the liquidity shock in 2013. Firm characteristics are all measured in year 2011.

	(1) Phase I	(2) Phase II	(3) Difference	(4) P-value
Repayment shock	142.360	102.105	-40.255	(0.460)
Investment	0.009	0.056	0.047	(0.136)
Leverage growth	-0.017	0.003	0.020	(0.408)
Liquidity growth	-0.151	-0.102	0.049	(0.364)
Total assets	5,139.655	6,743.966	1,604.311	(0.161)
Total liabilities	3,244.934	4,549.020	1,304.086	(0.123)
Cash	280.514	269.317	-11.197	(0.806)
Leverage ratio	0.373	0.396	0.022	(0.197)
Total debt	1,554.632	2,323.752	769.120	(0.127)
Long-term debt	814.032	1,168.053	354.021	(0.178)
Short-term debt	578.430	792.305	213.875	(0.195)

Table 2: Effects on Corporate Decisions

This table presents estimates from panel regressions explaining corporate decisions for the period 2009 to 2012. The dependent variable in Columns 1 and 2 is the first difference in the logarithm of fixed assets (Investment), the first difference in the logarithm of total liabilities in Columns 3 and 4 (Leverage growth), and the first difference in the logarithm of cash in Columns 5 and 6 (Liquidity growth). *Treated* is an indicator variable that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. *Year 2012* is an indicator variable for year 2012. Columns 1, 3, and 5 include year, region, and industry fixed effects. Columns 2, 4, and 6 include the interaction of *year* × *region* × *industry* fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

	Investment		Leverage Growth		Liquidity Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.014	-0.014	-0.012	-0.010	-0.014	-0.014
	(-0.96)	(-0.94)	(-0.80)	(-0.71)	(-0.61)	(-0.60)
Treated × Year 2012	0.052**	0.056**	-0.002	-0.010	0.126**	0.130**
	(2.08)	(2.17)	(-0.06)	(-0.35)	(2.23)	(2.28)
Year FE	Yes	No	Yes	No	Yes	No
Region FE	Yes	No	Yes	No	Yes	No
Industry FE	Yes	No	Yes	No	Yes	No
Year x Region x Industry FE	No	Yes	No	Yes	No	Yes
Observations	119838	119821	121125	121108	109238	109220
Adjusted R^2	0.003	0.002	0.009	0.011	0.007	0.010

Table 3: Dynamic Effects on Corporate Decisions

This table presents estimates from panel regressions explaining corporate decisions for the period 2009 to 2012. The dependent variable in Columns 1 and 2 is the first difference in the logarithm of fixed assets (Investment), the first difference in the logarithm of total liabilities in Columns 3 and 4 (Leverage growth), and the first difference in the logarithm of cash in Columns 5 and 6 (Liquidity growth). *Treated* is an indicator variable that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. *Year 2009*, *Year 2010*, and *Year 2012* are indicator variables for years 2009, 2010, and 2012, respectively. The omitted year (baseline) is 2011. Columns 1, 3, and 5 include year, region, and industry fixed effects. Columns 2, 4, and 6 include the interaction of *year* × *region* × *industry* fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

	Investment		Leverage Growth		Liquidity Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.046	-0.047	-0.016	-0.009	-0.062	-0.064
	(-1.47)	(-1.46)	(-0.66)	(-0.36)	(-1.15)	(-1.18)
Treated × Year 2009	0.052	0.055	0.014	0.006	0.112	0.131
	(1.42)	(1.47)	(0.41)	(0.16)	(1.42)	(1.63)
Treated × Year 2010	0.045	0.044	-0.001	-0.010	0.036	0.025
	(1.16)	(1.12)	(-0.02)	(-0.27)	(0.45)	(0.30)
Treated × Year 2012	0.084**	0.088**	0.003	-0.011	0.174**	0.180**
	(2.28)	(2.35)	(0.07)	(-0.31)	(2.13)	(2.20)
Year FE	Yes	No	Yes	No	Yes	No
Region FE	Yes	No	Yes	No	Yes	No
Industry FE	Yes	No	Yes	No	Yes	No
Year x Region x Industry FE	No	Yes	No	Yes	No	Yes
Observations	119838	119821	121125	121108	109238	109220
Adjusted R^2	0.003	0.002	0.009	0.011	0.007	0.010

Table 4: Effects on Corporate Decisions: Intensity of Repayment

This table analyzes corporate decisions for the period 2009 to 2012. The dependent variables are the first difference in the logarithm of fixed assets (Panel A: Investment), liabilities (Panel B: Leverage growth), and cash (Panel C: Liquidity growth). *Treated* is a dummy that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. Firms from Phase I and Phase II are matched based on total assets and the size of the repayment shock. *Year 2012* is an indicator variable for year 2012. We sort our sample into firms that received a repayment shock below 1% of their total assets, between 1% and 5%, between 5% and 10%, and above 10%. All regressions include the interaction of *year* × *region* × *industry* fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Investment

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated	-0.014	-0.017	-0.015	-0.028
	(-0.95)	(-1.11)	(-0.87)	(-1.61)
Treated × Year 2012	0.047*	0.062**	0.077**	0.114***
	(1.69)	(2.15)	(2.56)	(3.65)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Observations	79540	41667	15164	18659
Adjusted R^2	0.045	0.037	0.024	0.037

Panel B: Leverage growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated	-0.015	-0.021	-0.012	0.003
	(-0.92)	(-1.27)	(-0.65)	(0.16)
Treated × Year 2012	0.026	0.030	0.012	-0.128***
	(0.82)	(0.90)	(0.35)	(-3.60)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Observations	80002	42068	15330	19045
Adjusted R^2	0.084	0.073	0.070	0.091

Panel C: Liquidity growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated	0.006	-0.000	-0.018	-0.011
	(0.25)	(-0.00)	(-0.68)	(-0.41)
Treated × Year 2012	-0.019	0.035	0.152**	0.402***
	(-0.33)	(0.61)	(2.44)	(6.52)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Observations	72602	38058	13933	17253
Adjusted R^2	0.061	0.059	0.046	0.082

Table 5: Effects on Corporate Decisions: Firm FE

This table analyzes corporate decisions for the period 2009 to 2012. The dependent variables are the first difference in the logarithm of fixed assets (Panel A: Investment), liabilities (Panel B: Leverage growth), and cash (Panel C: Liquidity growth). *Treated* is a dummy that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. Firms from Phase I and Phase II are matched based on total assets and repayment shock. *Year 2012* is an indicator variable for year 2012. We sort our sample into firms that received a repayment shock below 1% of their total assets, between 1% and 5%, between 5% and 10%, and above 10%. All regressions include the interaction of *year* × *region* × *industry* fixed effects and firm fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Investment

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	0.037	0.046*	0.061**	0.082***
	(1.38)	(1.72)	(2.12)	(2.68)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	78121	40607	14694	17918
Adjusted R^2	0.119	0.105	0.068	0.089

Panel B: Leverage growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	0.031	0.029	0.004	-0.147***
	(0.97)	(0.90)	(0.12)	(-4.13)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	78610	41025	14867	18289
Adjusted R^2	0.120	0.104	0.075	0.109

Panel C: Liquidity growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	0.010	0.054	0.158**	0.421***
	(0.18)	(0.93)	(2.43)	(6.54)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	70630	36757	13365	16376
Adjusted R^2	-0.091	-0.098	-0.141	-0.095

Table 6: Effects on Corporate Decisions: Bank Heterogeneity

This table analyzes corporate decisions for the period 2009 to 2012 across bank types. Firms from Phase I and Phase II are matched based on bank type, total assets, and the repayment shock. *Treated* is a dummy that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. *Year 2012* is an indicator variable for year 2012. We sort our sample into firms that received a repayment shock below 1% and above 10% of their total assets. The sample "top banks" includes all firms that in 2009 worked with at least one bank with a core equity tier 1 (CET 1) capital ratio above 7.4. The sample "excluding top banks" includes all other firms. In Panel A, the dependent variable is the first difference in the logarithm of fixed assets. In Panel B, the dependent variable is the first difference in the logarithm of total liabilities. In Panel C, the dependent variable is the first difference in the logarithm of cash. All regressions include the interaction of *year* × *region* × *industry* fixed effects and firm fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Investment

	Top Banks		Excluding Top Banks	
	$< 1\%$	$> 10\%$	$< 1\%$	$> 10\%$
Treated × Year 2012	0.006	0.036	0.043	0.088**
	(0.18)	(0.73)	(1.25)	(2.39)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	28498	4143	49581	13625
Adjusted R^2	0.133	0.086	0.140	0.105

Panel B: Leverage growth

	Top Banks		Excluding Top Banks	
	$< 1\%$	$> 10\%$	$< 1\%$	$> 10\%$
Treated × Year 2012	0.008	-0.184***	0.040	-0.130***
	(0.20)	(-3.91)	(0.95)	(-2.90)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	28566	4168	50002	13972
Adjusted R^2	0.162	0.040	0.141	0.122

Panel C: Liquidity growth

	Top Banks		Excluding Top Banks	
	$< 1\%$	$> 10\%$	$< 1\%$	$> 10\%$
Treated × Year 2012	0.038	0.532***	0.012	0.397***
	(0.35)	(3.93)	(0.19)	(5.44)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	26404	3864	44172	12359
Adjusted R^2	0.022	-0.099	-0.086	-0.083

Table 7: Financial Debt and Accounts Payable

This table explores leverage decisions for the period 2009 to 2012. The dependent variables are the first difference in the logarithm of financial debt (Panel A) and accounts payable (Panel B). *Treated* is a dummy that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. Phase I firms are matched to firms in Phase II. *Year 2012* is an indicator variable for year 2012. We sort our sample into firms that received a repayment shock below 1% and above 10% of their total assets. The sample "top banks" includes all firms that in 2009 worked with at least one bank with a core equity tier 1 (CET 1) capital ratio above 7.4. The sample "excluding top banks" includes all other firms. All regressions include the interaction of *year* × *region* × *industry* fixed effects and firm fixed effects. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Financial debt growth

	Top Banks		Excluding Top Banks	
	$< 1\%$	$> 10\%$	$< 1\%$	$> 10\%$
Treated × Year 2012	-0.086*	-0.379***	0.095	-0.123
	(-1.75)	(-3.82)	(1.10)	(-1.49)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	12213	1204	15253	2735
Adjusted R^2	0.274	0.166	0.143	0.138

Panel B: Accounts payable growth

	Top Banks		Excluding Top Banks	
	$< 1\%$	$> 10\%$	$< 1\%$	$> 10\%$
Treated × Year 2012	0.016	-0.081	0.054	-0.159***
	(0.28)	(-1.01)	(1.01)	(-2.58)
Year x Region x Industry FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	28205	4062	48032	12813
Adjusted R^2	0.053	-0.034	0.007	-0.038

Table 8: Effects on Public Procurement

This table presents estimates from panel regressions explaining firms' public procurement decisions for the period 2009 to 2012. In this analysis, the unit of observation is at the firm-municipality-year level. In column 1, the dependent variable is a dummy taking value 1 if there is a new contract between a firm and a municipality and taking value zero otherwise. In column 2, the dependent variable is the natural logarithm of one plus the size of all the awarded contracts between the firm and the municipality in that year. *Arrears* is a dummy taking value 1 if the firm has accumulated arrears at the end of 2011 with a municipality, and taking value zero otherwise. *Year 2009*, *Year 2010*, *Year 2011* and *Year 2012* are indicator variables for years 2009, 2010, 2011 and 2012, respectively. All regressions include *year* × *firm* and *year* × *buyer municipality* fixed effects. Robust T-statistics are clustered at the firm and municipality level and shown in parentheses. ***, **, or * indicates that the coefficient is significant at the 1%, 5% or 10% level, respectively.

	New Contract (1)	New Contract Size (2)
Arrears × Year 2009	0.183	2.810
	(1.26)	(1.44)
Arrears × Year 2010	0.161	2.159
	(1.56)	(1.57)
Arrears × Year 2011	-0.217**	-3.001**
	(-2.24)	(-2.25)
Arrears × Year 2012	-0.100	-1.006
	(-0.65)	(-0.51)
Year x Firm FE	Yes	Yes
Year x Buyer FE	Yes	Yes
Observations	3976	3976
Adjusted R^2	0.189	0.174

Figure 1: Analytical Framework

The figure represents the financial interrelations between the central government, local and regional governments, firms, and banks.

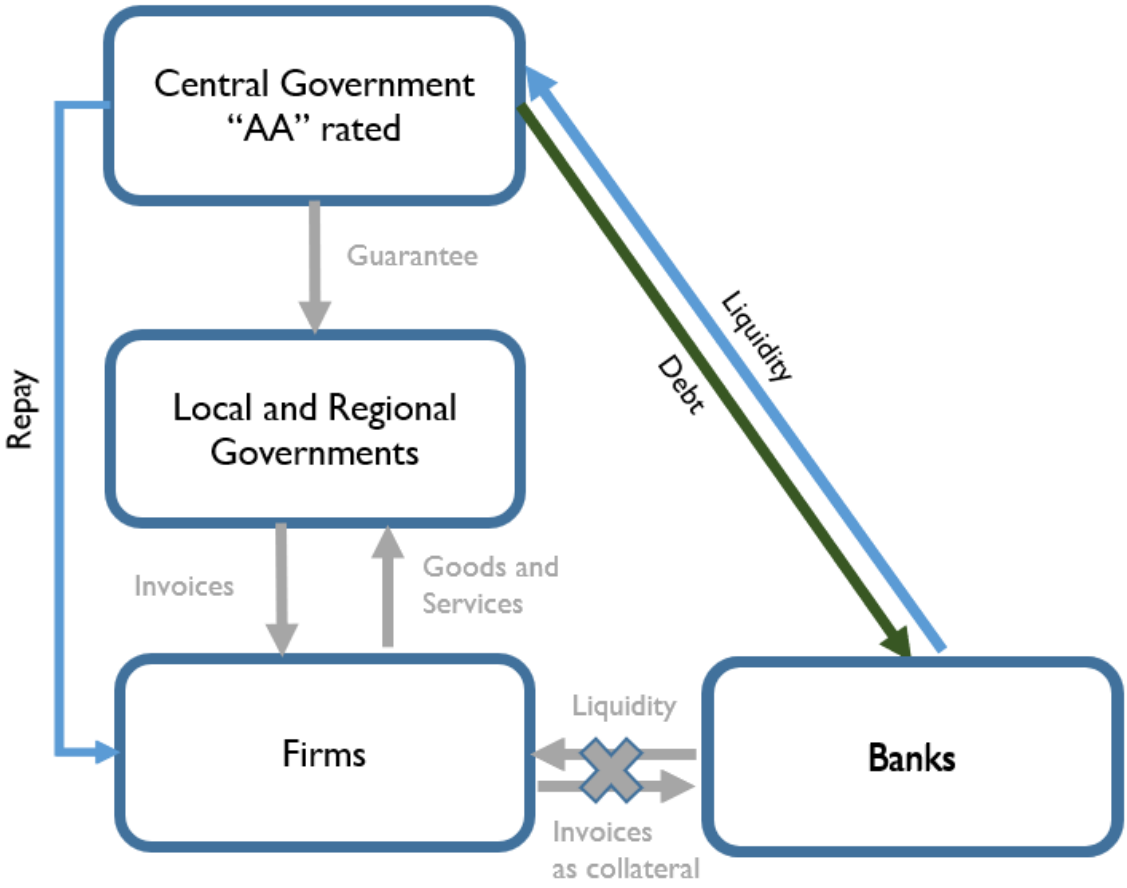
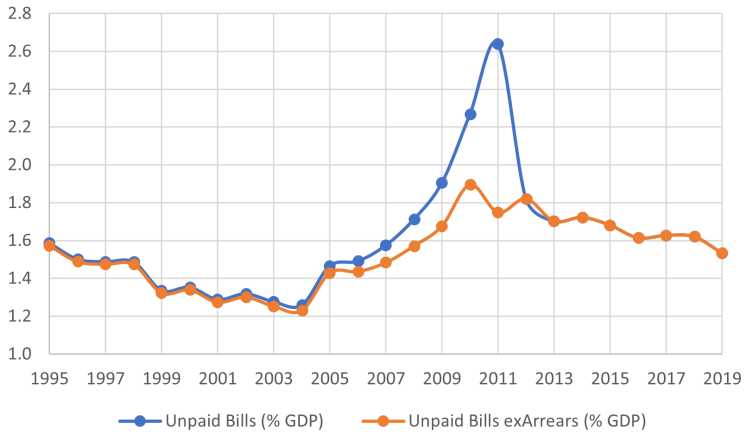


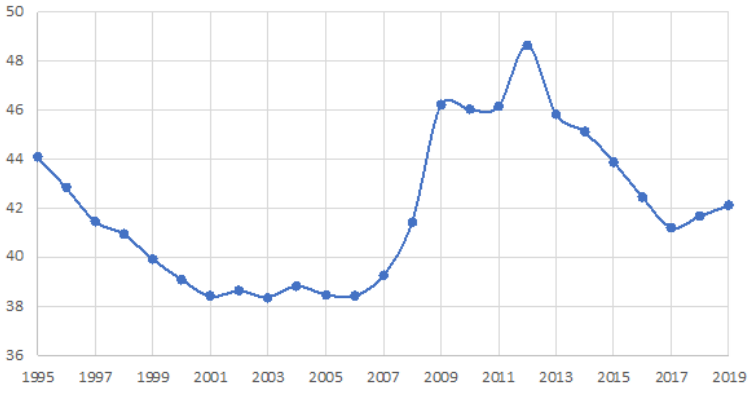
Figure 2: Spanish Municipalities

Panel A shows unpaid bills, with and without arrears, as a percentage of Gross Domestic Product (GDP) for Spanish municipalities. Panel B shows the total expenditure as a percentage of GDP for Spanish municipalities. Panel C shows the budget deficit as a percentage of GDP for Spanish municipalities. This information is obtained from the Bank of Spain. The sample covers the period 1995-2019.

Panel A: Unpaid Bills, with and without Arrears (% GDP)



Panel B: Total Expenditure (% GDP)



Panel C: Budget Deficit (% GDP)

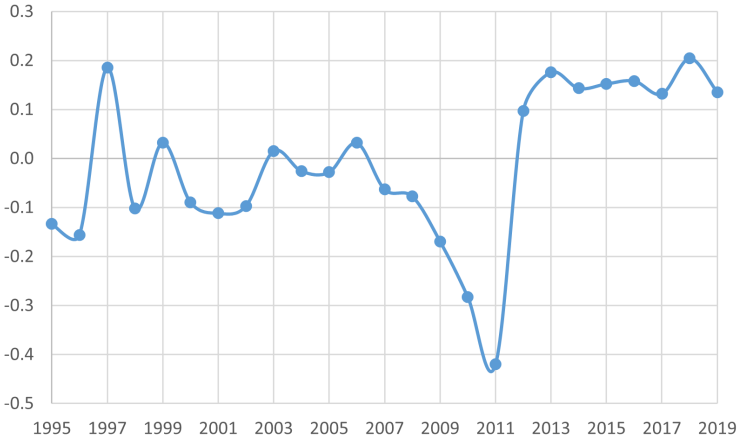
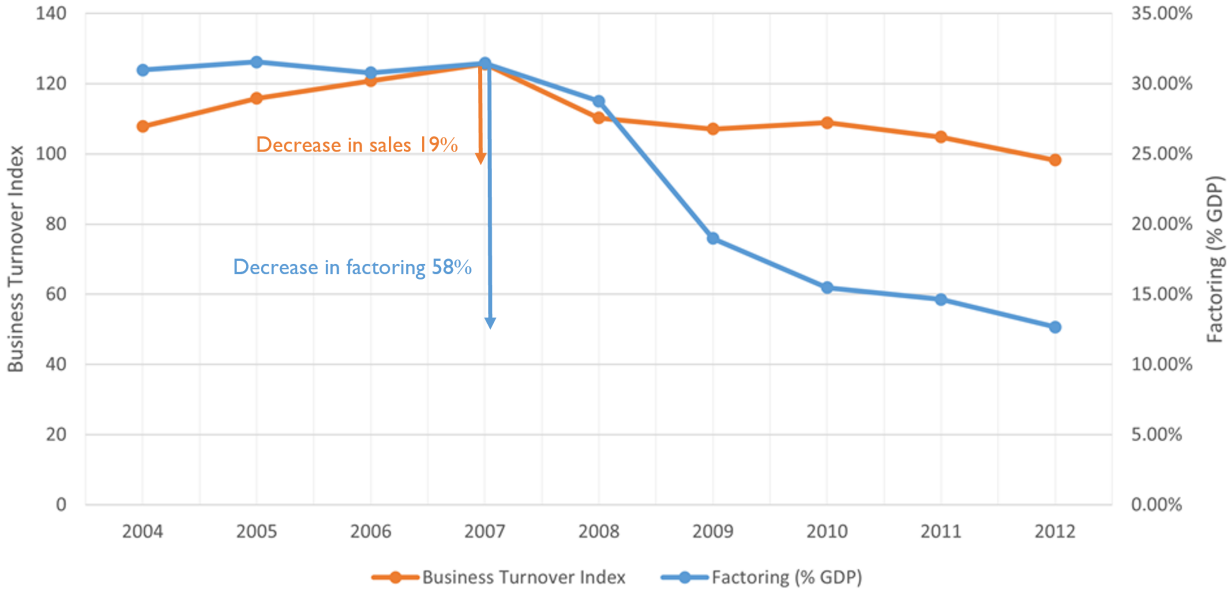


Figure 3: Factoring and Business Turnover Index

This graph shows the evolution of factoring of Spanish firms as a percentage of GDP and the Business Turnover Index for Spanish firms. This information is obtained from the Spanish Statistical Office. The period covered is 2004–2012.



Appendix for Online Publication: "Government Arrears and Corporate Decisions: Lessons from a Natural Experiment"

Jose M. Abad, Vicente J. Bermejo, Vicente Cuñat and Rafael Zambrana

In this Appendix, we provide additional statistics and robustness tests for the analyses in the paper. Specifically:

- Figure IA.1: Appearance of SPP news in Spanish Newspapers
- Figure IA.2: Average Payment Delay (Days) per Sector, 2005–11
- Figure IA.3: Mancomunidades and Municipalities
- Figure IA.4: Factoring of Arrears by Bank Type
- Table IA.1: Descriptive Statistics
- Table IA.2: Summary Statistics: Matched Sample
- Table IA.3: Effects on Corporate Decisions: Matched Sample
- Table IA.4: Dynamic Effects on Corporate Decisions: Matched Sample
- Table IA.5: Effects on Corporate Decisions: SDiD
- Table IA.6: Summary Statistics: Bank Heterogeneity
- Table IA.7: Effects on Corporate Decisions: Late Payment

Figure IA.1: Appearance of SPP news in Spanish Newspapers

The figure represents the total number of times that "Plan de Pago a Proveedores" (Supplier Payment Program) and "Plan de Pago a Proveedores" and the word "Mancomunidad" appear in the Spanish news every month from January 2011 to December 2013. Source: Factiva.

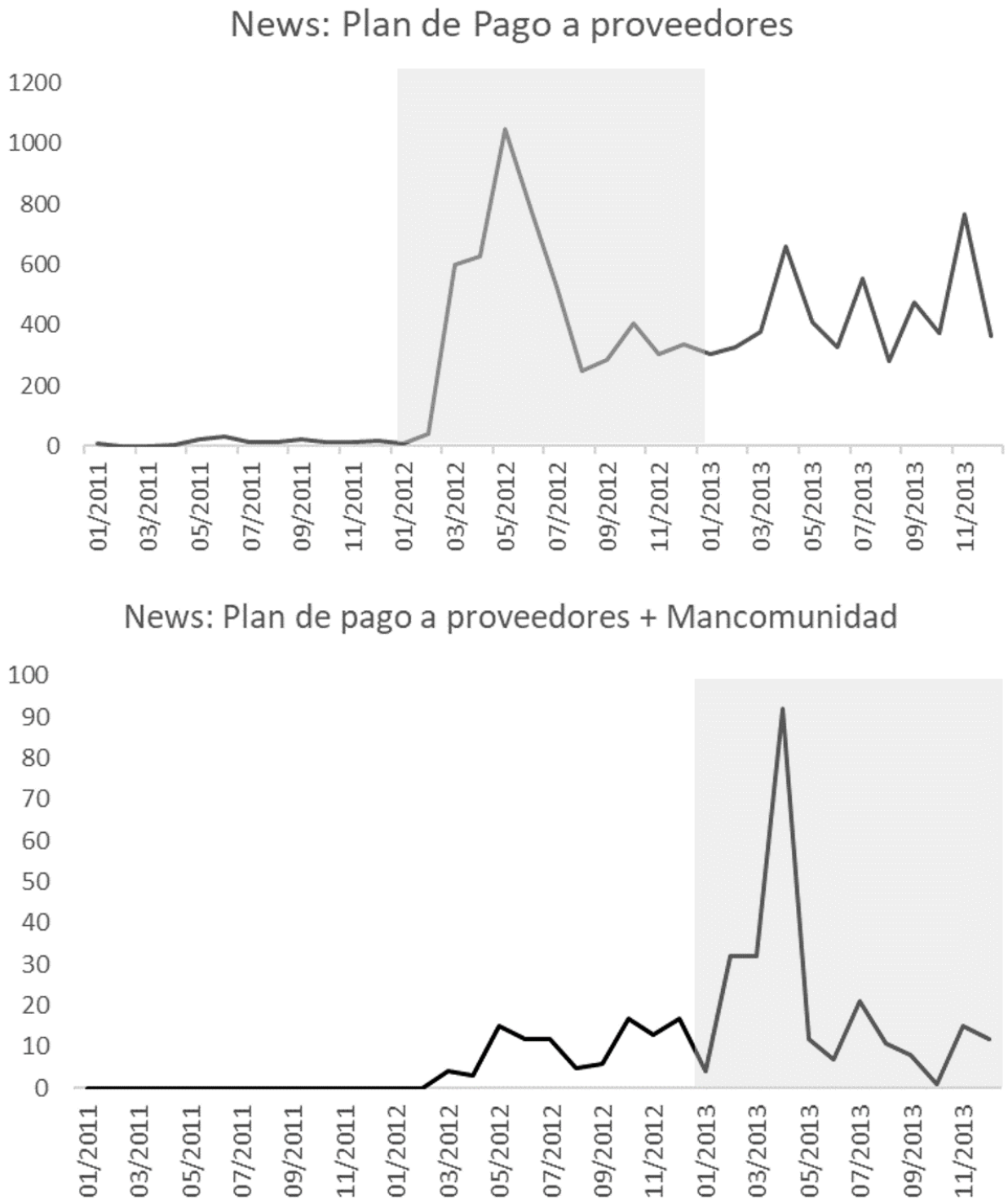


Figure IA.2: Average Payment Delay (days) Per Sector, 2005–11

The figure represents the average payment delay in days for private sector companies (orange) and for the public sector (gray) for the years 2005, 2008, 2009, 2010, and 2011.

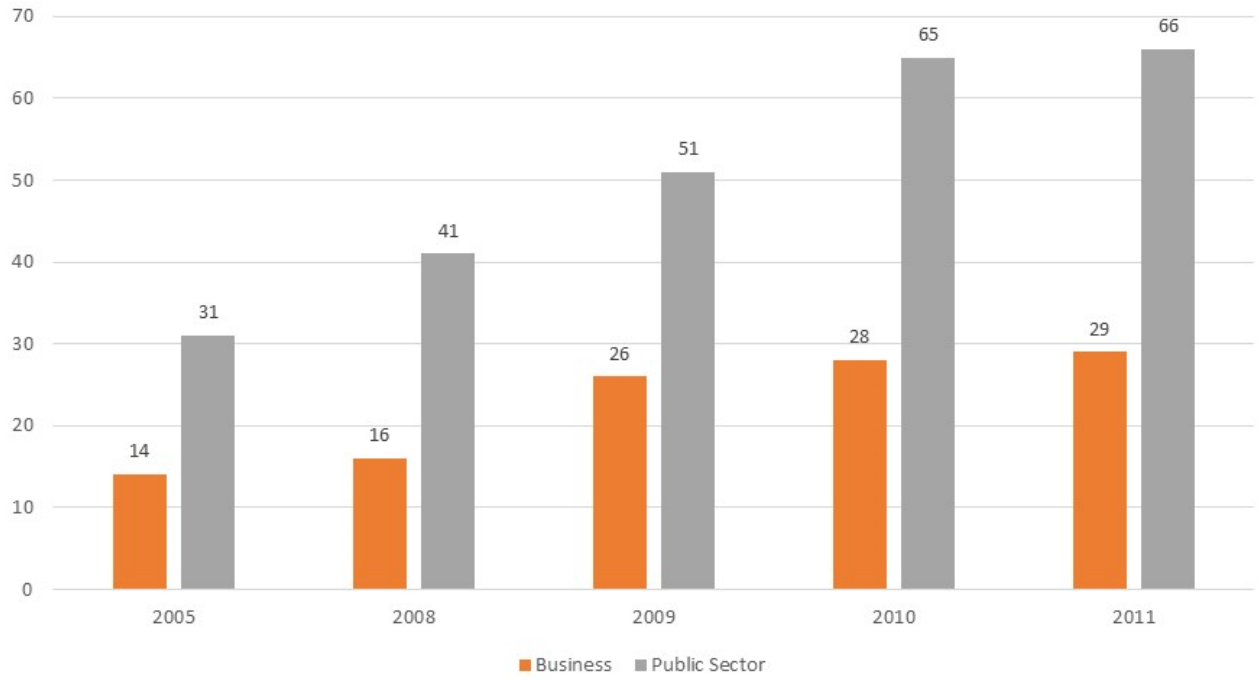


Figure IA.3: Mancomunidades and Municipalities

The figure shows the region of Andalucía in Spain and shows how municipalities in Spain can interact with suppliers as "Municipalities" that deal directly with suppliers or as "Mancomunidades" that involve several municipalities joining together to improve bargaining power. Source: Centro de Estudios Andaluces. Junta de Andalucia.

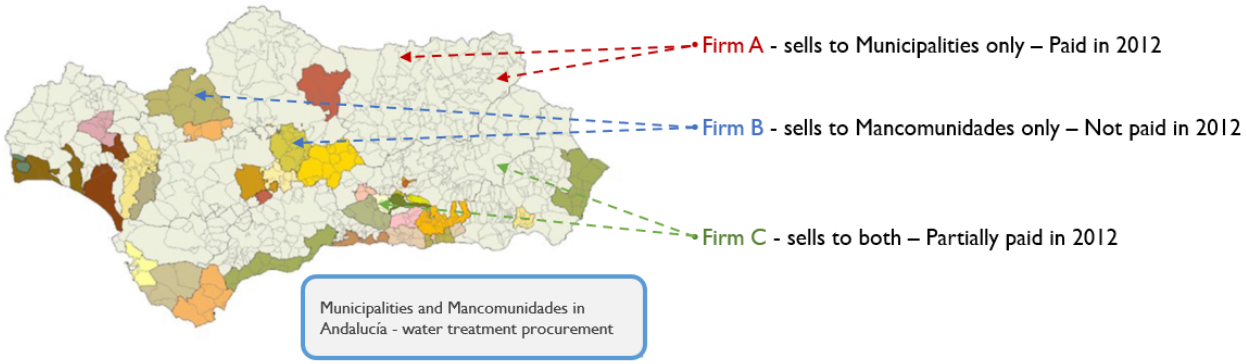


Figure IA.4: Factoring of Arrears by Bank Type

This graph shows the evolution of the factoring of arrears from the Spanish SPP by top banks and non-top banks. Top banks include banks with a core equity tier 1 (CET 1) capital ratio above 8 in the EBA stress tests developed in 2011. Non-top banks include banks with a core equity tier 1 (CET 1) capital ratio below 7.4 in the EBA stress tests developed in 2011. We sum the amount of arrears that have been factored per year and bank and calculate a weighted average for top banks vs. non-top banks. We weigh each bank by its market share in 2011. We normalize the amounts in 2008. The period covered is 2003–2011.

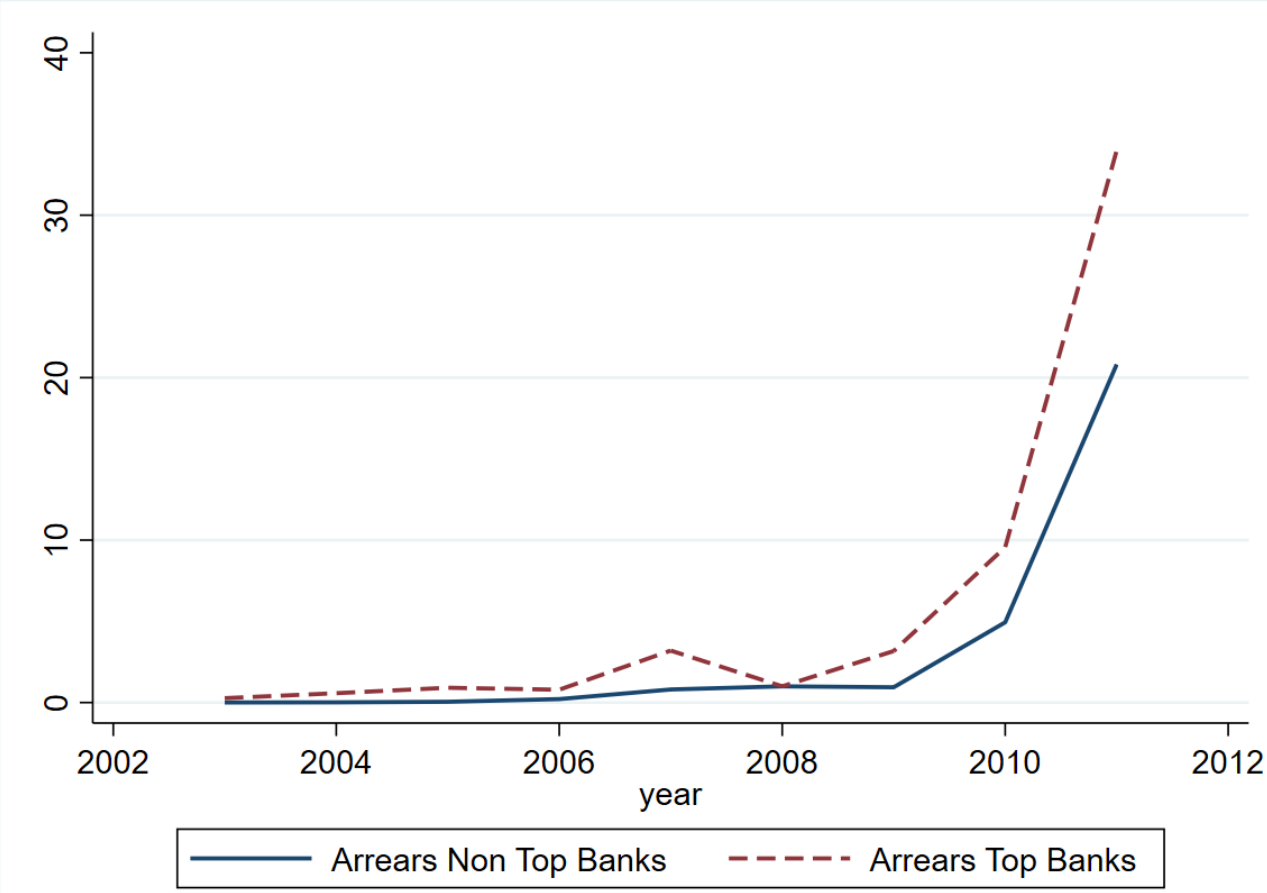


Table IA.1: Descriptive Statistics

This table reports mean, standard deviation, 25th-percentile, median, 75th-percentile, and number of observations for several variables. The sample covers the period 2009–2012.

	Mean	Std. deviation	Perc.25	Median	Perc.75	Observations
Repayment shock	125.25	1232.91	1.69	7.30	32.48	203795
Investment	0.02	0.47	-0.12	-0.03	0.06	155881
Leverage growth	-0.02	0.44	-0.18	-0.02	0.13	157309
Liquidity growth	-0.05	1.08	-0.60	-0.04	0.47	142338
Total assets	5146.40	19227.50	383.33	890.00	2448.00	166244
Total liabilities	3255.29	13179.71	220.00	515.00	1392.00	166243
Cash	294.62	1000.47	14.78	53.00	179.00	155219
Leverage ratio	0.37	0.27	0.17	0.33	0.52	107068
Total debt	1528.13	4960.33	127.00	325.00	887.00	107068
Long-term debt	804.44	3082.30	41.00	148.00	438.00	123263
Short-term debt	564.50	2041.63	26.26	93.38	298.00	134762

Table IA.2: Summary Statistics: Matched Sample

This table reports average firm characteristics for firms in Phase I and Phase II, the differences between the two groups of firms, and the p-values associated with those differences. Phase I includes the sample of firms that worked for local government entities that received the liquidity shock in year 2012, while Phase II includes firms that received the liquidity shock in 2013. Firms from Phase I and Phase II are matched based on total assets and the size of the repayment shock. Firm characteristics are all measured in year 2011.

	(1) Phase I	(2) Phase II	(3) Difference	(4) P-value
Repayment shock	142.360	142.389	0.028	(1.000)
Investment	0.009	0.057	0.048	(0.131)
Leverage growth	-0.017	0.004	0.021	(0.387)
Liquidity growth	-0.151	-0.115	0.036	(0.507)
Total assets	5,139.655	5,143.305	3.650	(0.996)
Total liabilities	3,244.934	3,394.125	149.191	(0.795)
Cash	280.514	225.966	-54.549	(0.089)*
Leverage ratio	0.373	0.399	0.025	(0.147)
Total debt	1,554.632	1,805.768	251.136	(0.504)
Long-term debt	814.032	929.024	114.992	(0.562)
Short-term debt	578.430	609.799	31.368	(0.796)

Table IA.3: Effects on Corporate Decisions - Matched Sample

This table presents estimates from panel regressions explaining corporate decisions for the period 2009 to 2012. The dependent variable in Columns 1 and 2 is the first difference in the logarithm of fixed assets (Investment), the first difference in the logarithm of total liabilities in Columns 3 and 4 (Leverage growth), and the first difference in the logarithm of cash in Columns 5 and 6 (Liquidity growth). *Treated* is an indicator variable that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. *Year 2012* is an indicator variable for year 2012. Columns 1, 3, and 5 include year, region, and industry fixed effects. Columns 2, 4, and 6 include the interaction of *year* × *region* × *industry* fixed effects. Firms from Phase I and Phase II are matched based on total assets and the size of the repayment shock. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

	Investment		Leverage Growth		Liquidity Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.020	-0.020	-0.017	-0.015	-0.019	-0.004
	(-1.34)	(-1.35)	(-1.09)	(-0.95)	(-0.76)	(-0.19)
Treated × Year 2012	0.056**	0.070**	0.002	0.006	0.128**	0.096*
	(2.18)	(2.51)	(0.07)	(0.17)	(2.30)	(1.76)
Year FE	Yes	No	Yes	No	Yes	No
Region FE	Yes	No	Yes	No	Yes	No
Industry FE	Yes	No	Yes	No	Yes	No
Year x Region x Industry FE	No	Yes	No	Yes	No	Yes
Observations	114277	114260	115469	115452	104386	104368
Adjusted R^2	0.005	0.044	0.013	0.083	0.010	0.065

Table IA.4: Dynamic Effects on Corporate Decisions - Matched Sample

This table presents estimates from panel regressions explaining corporate decisions for the period 2009 to 2012. The dependent variable in Columns 1 and 2 is the first difference in the logarithm of fixed assets (Investment), the first difference in the logarithm of total liabilities in Columns 3 and 4 (Leverage growth), and the first difference in the logarithm of cash in Columns 5 and 6 (Liquidity growth). *Treated* is an indicator variable that takes a value of 1 for firms that received repayment in Phase I (2012) and zero for firms that received repayment a year later in Phase II. *Year 2009*, *Year 2010*, and *Year 2012* are indicator variables for years 2009, 2010, and 2012, respectively. The omitted year (baseline) is 2011. Columns 1, 3, and 5 include year, region, and industry fixed effects. Columns 2, 4, and 6 include the interaction of *year* × *region* × *industry* fixed effects. Firms from Phase I and Phase II are matched based on total assets and the size of the repayment shock. Robust T-statistics are clustered at the firm level and shown in parentheses. ***, ** or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

	Investment		Leverage Growth		Liquidity Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.052	-0.047	-0.023	-0.017	-0.043	-0.048
	(-1.62)	(-1.41)	(-0.86)	(-0.60)	(-0.75)	(-0.91)
Treated × Year 2009	0.058	0.046	0.030	0.013	0.069	0.126
	(1.51)	(1.18)	(0.74)	(0.31)	(0.78)	(1.63)
Treated × Year 2010	0.039	0.036	-0.011	-0.005	0.009	0.015
	(0.98)	(0.90)	(-0.30)	(-0.14)	(0.10)	(0.19)
Treated × Year 2012	0.087**	0.096**	0.007	0.008	0.153*	0.140*
	(2.32)	(2.38)	(0.20)	(0.18)	(1.86)	(1.78)
Year FE	Yes	No	Yes	No	Yes	No
Region FE	Yes	No	Yes	No	Yes	No
Industry FE	Yes	No	Yes	No	Yes	No
Year x Region x Industry FE	No	Yes	No	Yes	No	Yes
Observations	114277	114260	115469	115452	104386	104368
Adjusted R^2	0.005	0.045	0.013	0.083	0.010	0.066

Table IA.5: Effects on Corporate Decisions: SDiD

This table presents estimates from SDiD (Arkhangelsky et al., 2021) regressions explaining corporate decisions for the period 2009 to 2012. The dependent variables are the first difference in the logarithm of fixed assets (Panel A: Investment), liabilities (Panel B: Leverage growth), and cash (Panel C: Liquidity growth). *Treated* is a dummy that takes a value of 1 for firms that received repayment in Phase II (2013) and zero for firms that received repayment a year earlier in Phase I. *Year 2012* is an indicator that equals 1 for year 2012. We sort our sample into firms that received a repayment shock below 1% of their total assets, between 1% and 5%, between 5% and 10%, and above 10%. Robust T-statistics are shown in parentheses. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Panel A: Investment

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	0.001	-0.010	-0.017	-0.050***
	(0.46)	(-0.73)	(-1.60)	(-3.79)

Panel B: Leverage growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	-0.003	-0.003	0.026	0.094***
	(-0.14)	(-0.10)	(0.82)	(8.09)

Panel C: Liquidity growth

Arrears/Assets →	$< 1\%$	$1\% - 5\%$	$5\% - 10\%$	$> 10\%$
Treated × Year 2012	-0.002	-0.021	-0.103*	-0.284***
	(-0.11)	(-0.84)	(-1.81)	(-5.78)

Table IA.6: Summary Statistics: Bank Heterogeneity

This table reports average firm characteristics for firms in Phase I and Phase II, the differences between the two groups of firms, and the p-values associated with those differences. Phase I includes the sample of firms that worked for local government entities that received the repayment shock in year 2012, and Phase II includes firms that received the repayment shock in 2013. Firms from Phase I and Phase II are matched based on total assets and the size of the repayment shock. Panel A compares firms in Phase I and Phase II for the sample of "top banks" (e.g., firms that in 2009 worked with at least one bank with a core equity tier 1 (CET 1) capital ratio above 7.4). Panel B compares firms in Phase I and Phase II for the sample of "excluding top banks" (e.g., firms that in 2009 did not work with a top bank). Firm characteristics are all measured in year 2011.

Panel A: Excluding top banks

	(1) Phase I	(2) Phase II	(3) Difference	(4) P-value
Repayment shock	81.357	107.892	26.535	(0.771)
Investment	0.014	0.079	0.064	(0.111)
Leverage growth	-0.000	0.026	0.026	(0.369)
Liquidity growth	-0.140	-0.113	0.027	(0.664)
Total assets	2,627.548	2,748.122	120.574	(0.814)
Total liabilities	1,698.016	1,852.856	154.840	(0.721)
Cash	169.688	147.879	-21.808	(0.271)
Leverage ratio	0.400	0.439	0.039	(0.072)*
Total debt	905.104	981.637	76.533	(0.781)
Long-term debt	507.486	603.271	95.785	(0.544)
Short-term debt	314.369	271.701	-42.668	(0.511)

Panel B: Top banks

	(1) Phase I	(2) Phase II	(3) Difference	(4) P-value
Repayment shock	285.558	260.105	-25.454	(0.906)
Investment	-0.004	-0.010	-0.006	(0.883)
Leverage growth	-0.054	-0.064	-0.009	(0.813)
Liquidity growth	-0.175	-0.121	0.053	(0.621)
Total assets	11,036.557	13,316.595	2,280.038	(0.429)
Total liabilities	6,876.159	8,653.532	1,777.373	(0.375)
Cash	533.931	478.045	-55.886	(0.634)
Leverage ratio	0.319	0.297	-0.022	(0.359)
Total debt	2,880.883	3,880.738	999.855	(0.363)
Long-term debt	1,482.203	1,865.653	383.450	(0.528)
Short-term debt	1,157.321	1,625.311	467.989	(0.280)

Table IA.7: Effects on Corporate Decisions: Late Payment

This table examines the effects of late payment on investment and financing decisions during the accumulation of public arrears from 2009 to 2011. Firms with public arrears are matched to firms without public arrears based on total assets, investment, leverage growth, liquidity growth, financial debt growth, and accounts payable growth in the year before the analysis (2008). The treatment group consists of firms with arrears, while the control group is a re-weighted sample of firms without arrears. The weights are used to match the first and second moments of firm characteristics between the treatment and control groups. *Arrears* is a dummy variable equal to 1 for firms in the treatment group and 0 for firms in the control group. Firms are classified as having arrears if their total accumulated unpaid bills by public entities exceeded 1% of their assets in 2011. Panel A reports average firm outcomes for firms with Arrears and firms in the control group, the differences between the two groups of firms, and the p-values associated with those differences. Panel B presents the baseline results. Panel C explores bank heterogeneity, classifying firms based on whether they work with "top" banks (e.g., firms that in 2009 worked with at least one bank with a core equity tier 1 (CET 1) capital ratio above 7.4). The dependent variables include the first differences in the logarithms of fixed assets, total liabilities, cash, accounts payable, and financial debt. All regressions include interactions of *year* × *region* × *industry* fixed effects. Robust t-statistics, clustered at the firm level, are reported in parentheses. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

Panel A: Summary statistics of the matched sample in 2008

Variable	(1) Arrears	(2) Control	(3) Difference	(4) P-val
Investment	0.065	0.066	0.001	(0.808)
Leverage growth	-0.021	-0.020	0.001	(0.807)
Liquidity growth	-0.283	-0.281	0.002	(0.873)
Accounts payable growth	0.045	0.045	0.000	(0.986)
Financial debt growth	0.173	0.175	0.002	(0.830)

Panel B: Baseline specification

	Investment (1)	Leverage growth (2)	Liquidity growth (3)	Acc. Payable growth (4)	Fin. debt growth (5)
Arrears	-0.003	0.009***	0.038***	0.027***	0.020***
	(-1.08)	(4.56)	(6.45)	(7.49)	(3.47)
Year x Region x Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	260844	260844	260844	260844	260844
Adjusted R^2	0.002	0.007	0.009	0.004	0.005

Panel C: Bank heterogeneity

	Investment (1)	Leverage growth (2)	Liquidity growth (3)	Acc. payable growth (4)	Fin. debt growth (5)
Top Bank=0 × Arrears	-0.007**	0.014***	0.037***	0.037***	0.010
	(-2.02)	(5.91)	(5.36)	(8.37)	(1.60)
Top Bank=1 × Arrears	0.006	-0.002	0.042***	0.003	0.043***
	(1.43)	(-0.69)	(4.17)	(0.68)	(4.31)
Year x Region x Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	260844	260844	260844	260844	260844
Adjusted R^2	0.002	0.008	0.009	0.004	0.005